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MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES, POLLUTION ABATEMENT, PUBLIC HEALTH. ALTAMAHA BASIN

Public Health Service
Atlanta, Georgia

June 1962

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ALTAMAHA
BASIN

PB 229 785

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TECHNICAL MEMORANDA FOR WATER SUPPLIES POLLUTION ABATEMENT AND PUBLIC HEALTH

v. 3,

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PREPARED FOR
UNITED STATES STUDY COMMISSION, SOUTHEAST RIVER BASINS
BY
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, REGION IV
WATER SUPPLY & POLLUTION CONTROL PROGRAM
ATLANTA, GEORGIA
JUNE 1962

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UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service, Region IV
Water Supply and Pollution Control Program

Technical Memoranda

for

Municipal, Industrial and Domestic Water Supplies
Pollution Abatement
Public Health

ALTAMAHA BASIN

Prepared for

United States Study Commission,
Southeast River Basins
Atlanta, Georgia
June 1962

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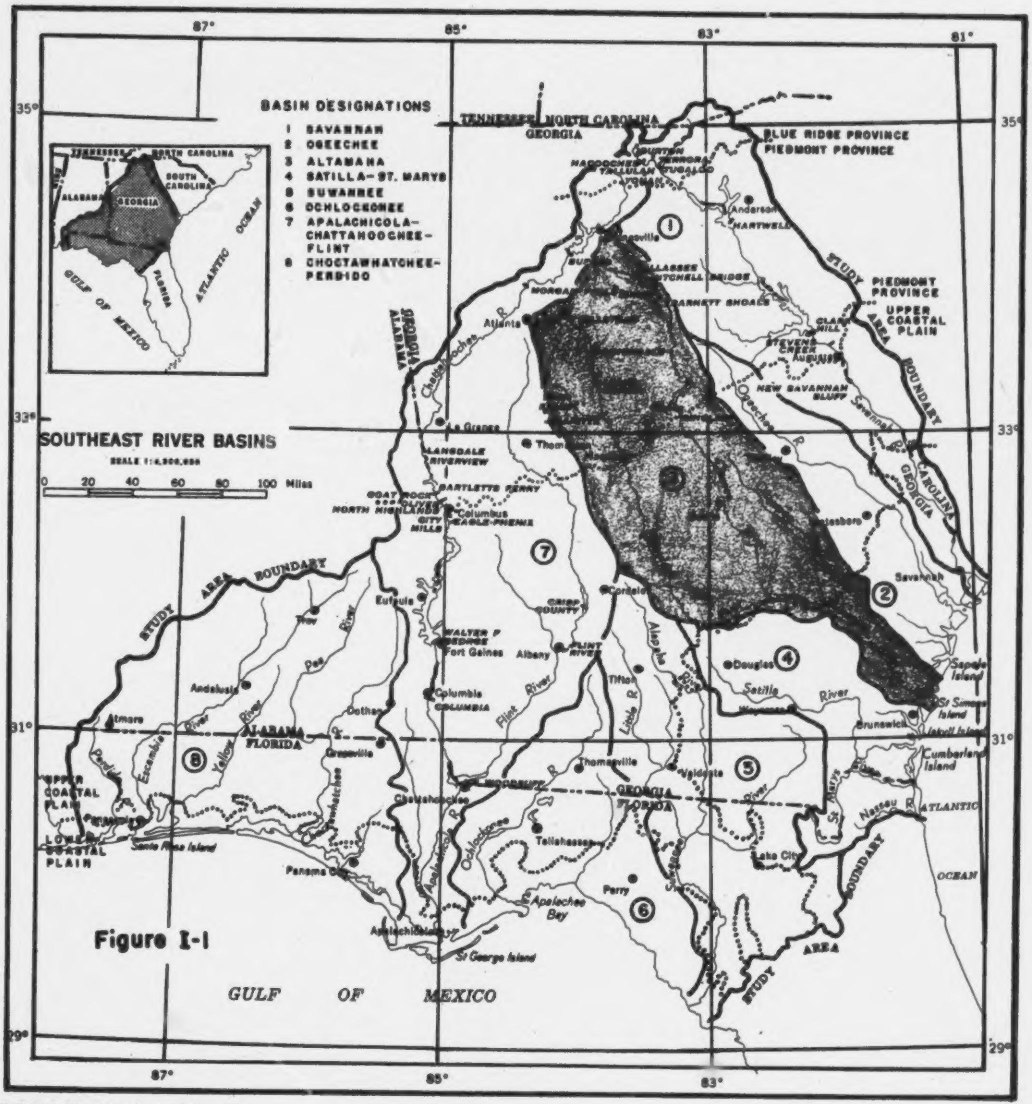
SOUTHEAST RIVER BASINS
SCALE 1:4,000,000
0 20 40 60 80 100 Miles
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1 SAVANNAH
2 OGEECHEE
3 ALTAMAHA
4 SATILLA–ST. MARYS
5 SUWANNEE
6 OCHLOCKONEE
7 APALACHICOLA-CHATTAHOOCHEE-FLINT
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TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
BLUE RIDGE PROVINCE
PIEDMONT PROVINCE
UPPER COASTAL PLAIN
LOWER COASTAL PLAIN
STUDY AREA BOUNDARY
Atlanta
Anderson
HARTWELL
CLARK HILL
Augusta
NEW SAVANNAH BLUFF
Savannah
La Grange
Columbus
Eufaula
Fort Gaines
Albany
Cordele
Tifton
Douglas
Waycross
Brunswick
Sapelo Island
St Simons Island
Jekyll Island
Cumberland Island
Thomasville
Valdosta
Tallahassee
Lake City
Perry
Apalachee Bay
Apalachicola
St George Island
Panama City
Santa Rosa Island
Atmore
Andalusia
Troy
Dothan
Chattahoochee
JIM WOODRUFF
WALTER F GEORGE
Flint River
Satilla River
Escambia River
Yellow River
Pea River
87°
85°
83°
81°
35°
33°
31°
29°

Figure I-1

U. S. Study Commission, Southeast River Basins
P. O. Box 953, Atlanta 1, Georgia

PREFACE

SCOPE

The U. S. Study Commission, Southeast River Basins, on December 30, 1959 and March 11, 1960, requested the assistance of the Public Health Service in:

(1) Formulating a domestic, municipal and industrial water supply plan, including pertinent economic studies,

(2) Formulating a water quality management plan including water pollution abatement and pertinent economic studies, and

(3) Formulating a plan for the protection of public health related to plans for the conservation, utilization, and development of land and water resources of the study area.

The Study Commission proposed that the Public Health Service compile the required basic data and prepare "single-purpose technical memoranda" on each of the above subjects and that these technical memoranda set forth the requirements for development to serve the above functions at present, in 1975, and 2000 in each of the eight river basins of the study area.

These memoranda on the Altamaha Basin have been prepared in fulfillment of the Commission's requests. They have been divided into three separate memoranda: MUNICIPAL, INDUSTRIAL, AND DOMESTIC WATER SUPPLIES; POLLUTION ABATEMENT; and PUBLIC HEALTH. In addition, a separate report has been prepared by the Public Health Service for the U. S. Study Commission: Water Quality Basic Data - Southeast River Basins, dated 1961. This report covers the Altamaha Basin as well as the seven other Basins within the U. S. Study Commission study area.

Report

The purpose of these memoranda is to provide data and information to the U. S. Study Commission - SERB on the present and projected status of water supply, pollution abatement, and public health facilities and programs for use in the preparation of a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Altamaha Basin.

AUTHORITY

The Study Commission's requests are in partial fulfillment of its obligation under Public Law 85-850 which states in part: "In carrying out the purpose of this Act it shall be the policy of Congress to utilize the services, studies, surveys, and continuing investigational programs of the departments, bureaus, and agencies of the United States." The Act also states that the Commission may "secure directly from any executive department, bureau, agency, commission, office, independent establishment, or instrumentality, information, suggestions, estimates, and statistics for the purpose of this Act, and each such department, bureau, agency, board, commission, office establishment, or instrumentality is authorized to furnish such information, suggestions, estimates and statistics directly to the Commission, upon request by the Chairman or Vice Chairman."

The authority for the Public Health Service to undertake this study and the preparation and submission of these technical memoranda stems from the above and from the Public Health Service Act of 1944 (Public Law 410, 78th Congress) and its amendments; the Federal Water Pollution Control Act (Public Law 660, 84th Congress), and its amendments; Federal legislation on air pollution (Public Law 159, 84th Congress), with amendments; related miscellaneous provision of other statutues; and the Public Health Service Regulations.

Public Law 85-850, under which the U. S. Study Commission operates, provides for investigations and studies and the preparation of a comprehensive and coordinated plan for the conservation, utilization, and development of land and water resources in the study area. In this plan formulation, the law specified, among other things, the inclusion of plans for:

(1) domestic and municipal supplies;

(2) possibilities of industrial development and utilization;

(3) pollution abatement and the protection of public health; and

(4) other beneficial and useful purposes.

ECONOMIC BASIS FOR PLANNING

Projections for 1975 and 2000 in this report were made using estimates of economic development furnished to the Public Health Service by the U. S. Study Commission, Southeast River Basins. The pattern of the future economy stems mainly from projections of population, employment, and income furnished by the Commission. The basic aggregate projections for these three components are considered by the Commission to be relatively firm. The breakdown of the basic projections into their different components and the derivation of data for river basins is based, in some cases, on limited information. The Commission emphasizes that these are preliminary estimates and that the pattern of the projected economy should not be taken as a rigid goal, but should be considered flexible and subject to modification and refinement as the results of future studies become available.

RESPONSIBILITIES

The basic responsibility for the administration of Federal programs in municipal water supply, pollution control, and public health is vested in the Public Health Service. State programs and responsibilities are administered by the State health departments and water pollution control agencies. In the administration of these Federal and State programs, cooperation and assistance of other agencies with interests in these fields are obtained. The responsibilities and interests of all Federal, State, and local agencies in municipal water supply, pollution control and public health programs in the Altamaha Basin are enumerated below.

PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

The Public Health Service serves in a consulting capacity to other Federal agencies and to the State and local health departments on matters relating to water supply, water pollution control, vector control, and other matters related to public health; makes investigations and studies; does scientific research in the above fields; collects vital statistics; and operates certain medical care and quarantine programs. In protecting the public health, the Service is responsible for developing and recommending procedures for the prevention and control of mosquitoes and other vectors associated with Federal water development projects.

As part of its responsibilities under the Federal Water Pollution Control Act (Public Law 660, 84th Congress) as amended, the Service is required to prepare or develop in cooperation with other Federal agencies, State and interstate water pollution control agencies, municipalities and industries, comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary conditions of surface and underground waters. In the development of such comprehensive programs, due regard is given to the improvements which are necessary to conserve such waters for public water supplies; propagation of fish and aquatic life and wildlife; recreational purposes; and agricultural, industrial, and other legitimate uses. The Service is further authorized to advise any Federal construction agency concerning the inclusion of storage in any proposed reservoir for regulations of stream flow for the purpose of water quality control.

The Public Health Service is authorized to make joint investigations, with any such agencies, of the condition of any waters in any State or States, and of the discharge of any sewage, industrial wastes, or substance which may adversely affect such waters.

Section 8 (a) of Public Law 660 states that "The pollution of interstate or navigable waters in or adjacent to any State or States (whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters), which endangers the health or welfare of any persons shall be subject to abatement as provided in this Act."

The Public Health Service works closely with State agencies and makes investigations and studies relating to health and pollution control aspects of development programs pertaining to municipal, industrial, and domestic water supplies. The Service also has the responsibility of collecting and disseminating basic data on radiological, chemical, physical, and biological water quality and other information insofar as such data and information relate to water pollution and the prevention and control thereof.

CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

The Corps of Engineers operates the Federal program for the improvement and maintenance of rivers and other waterways in the interest of navigation and flood control. Water conservation and other water use functions beneficial to the public are considered in carrying out investigations and construction of water projects. Health matters relating to these projects include vector control, sanitation of work camps, recreation, water supplies, and water pollution abatement.

SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE

The Soil Conservation Service, under Public Law 566, 83rd Congress, as amended, prepares watershed work plans for small watersheds to assure water-flow retardation and soil erosion prevention. In the development of these work plans, consideration is given to water use functions beneficial to the people of the area, including irrigation, stock watering, and fish and wildlife propagation and municipal and industrial water supply. Control of insects around the watershed and use of water for domestic purposes are also given consideration.

FOREST SERVICE, DEPARTMENT OF AGRICULTURE

The Forest Service is responsible for the development and management of National Forests to preserve and increase the multiple benefits from these natural resources. Good forest management retards rapid runoff and prevents soil erosion, thus reducing pollution from natural sources. Sanitation of public facilities in National Forests is under the supervision of the Forest Service and privately operated facilities are regulated by use permits issued by the Service. It is to be noted, however, that Section 480, Title 16, U. S. Code states that jurisdiction over persons within National Forests should not be affected by the reason of these forests' existence. Thus, health and sanitation in National Forests is of concern to State and local health authorities.

GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

The Geological Survey is primarily a fact-finding and research agency. It collects, analyzes, and interprets basic data on water, mineral, and land resources, and prepares topographic and geological maps and reports as a prerequisite to planning, constructing, and operating projects for the development and utilization of these natural resources.

NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR

The National Park Service administers programs for the National Parks, monuments, historic sites, and similar areas. It has the responsibility for maintaining sanitary and healthful conditions in these areas. The Service cooperates with other agencies in investigating the recreational possibilities at proposed reservoir projects and in planning for their protection, development, and utilization.

ATOMIC ENERGY COMMISSION

The Atomic Energy Act of 1954 authorizes the Atomic Energy Commission to regulate the use of certain radioactive materials and certain facilities, which produce or use these materials, to protect against hazards to life or property. A National Committee on Radiation Protection, comprised of members of several Federal agencies including the Public Health Service and professional organizations, prepares recommendations on protection from radioactive substances.

GEORGIA DEPARTMENT OF PUBLIC HEALTH

The State has retained all responsibilities and duties for the health of the public not otherwise granted to the Federal government in the Federal Constitution or by Acts of Congress. The State operates under the police power, inherent in the soverign State to enact and enforce laws to protect and promote the health, safety, morals, order, peace, comfort, and general welfare of the people. Among the powers of the State Board of Health are the following:

1. Adopt rules, regulations, and orders.

2. Enforce State laws, regulations, and orders.

3. Isolate and quarantine, make sanitary investigations and inspections, and collect vital statistics.

4. Review plans and specifications for any new municipal water systems to be installed, or changes to be made in any existing system by any city, corporation, partnership, or individual.

5. Inspect the source of municipal water supply and to determine if the water is impure and dangerous to individuals or to the public generally.

6. Act in a consultative capacity to local agencies.

7. Approve and regulate the impounding of waters as they affect insect and vector control.

The Georgia Water Quality Act (Laws of Georgia, 1957, Act No. 491) provides for the control of water quality within the State and the regulation of public water supply treatment facilities. It prohibits the discharge of sewage, industrial wastes, or other wastes into the waters of the State which would adversely affect the health of the people or render such waters unsuitable for their then current uses, and provides for the treatment of such wastes. It provides for the issuance of certificates to persons discharging or permitting to be discharged into the waters of the State any sewage, industrial wastes, or other wastes.

The Act declares it to be the policy of the State of Georgia that the water resources of the State shall be utilized prudently to the maximum benefit of the people without so impairing the quality of the water resources as to jeopardize public water supplies and public health, and without interfering unreasonably with beneficial use of the water resources for recreation, fish and wildlife development, agriculture, and the industrial development of the State's natural resources and its manpower. The State water pollution control agency (State Board of Health) is charged with the responsibility, and has the authority to require the use of reasonable methods to prevent and control the pollution of the waters of the State.

The State Board of Health under the Water Quality Act, has the responsibility and power to, as it deems necessary, establish such standards of quality for any waters in relation to the reasonable and proper use thereof, and such general policies and standards relating to any existing or future pollution of such waters. The State Board of Health has the power to issue orders directing any particular person or persons to secure within the time specified therein, such operating results as are reasonable and practicable of attainment toward the control, abatement, and prevention of pollution of the waters of the State and the preservation of the necessary quality for the reasonable use thereof.

The State Board of Health has the power to establish such policies, requirements, and/or standards governing the source, distribution, purification, treatment and storage of water for public or community water supply systems as it deems necessary for the reasonable and proper use thereof in conformity with the intent of the Water Quality Act. The Act states that it shall be unlawful for any person to erect, construct, enlarge, extend, open, reopen, or operate any public or community water supply system including storage, distribution, purification treatment facilities or works, without having first secured from the Board approval of the source of water supply; the means and methods of treating, purifying and storing water; plans and specifications for the construction of facilities or works; and the operation thereof.

LOCAL HEALTH DEPARTMENTS (GEORGIA)

Georgia laws provide for the formation of county boards of health. These are created for the purpose of carrying out State rules, regulations, and orders as well as adopting other regulatory measures needed for protecting the public health within the local jurisdiction. Local boards of health in Georgia have the power to:

1. Adopt rules, regulations, and orders.
2. Enforce State laws, regulations, and orders.
3. Enforce local regulations and ordinances.
4. Make sanitary inspections and investigations, isolate, quarantine, and abate nuisances.

GEORGIA OIL AND GAS COMMISSION

The Georgia Oil and Gas Commission is authorized to make rules, regulations, and orders for the prevention of the pollution of fresh water supplies by oil, gas or salt water (1955 Cum. Supp., Title 43, Section 713).

GEORGIA GAME AND FISH COMMISSION

In the protection of fish and other aquatic life, the Georgia Game and Fish Commission is vitally interested in habitat waters. This agency cooperates with other State and Federal agencies in investigations and studies of water quality as related to fish and other aquatic life. This Agency enforces legislation against the use of explosives, poisonous substances, etc. for the purpose of catching, killing, taking or harming fish (1955 Cum. Supp., Title 45, Section 703).

GEORGIA WATER QUALITY COUNCIL

The Georgia Water Quality Council makes recommendations to the State Board of Health with regard to regulations, procedures, standards, waste disposal certificates, and policies governing public and community water supplies and waste disposal into waters of the State for controlling pollution and quality of such waters.

GEORGIA DEPARTMENT OF MINES, MINING, AND GEOLOGY

The Division of Conservation in this Department collects and compiles water resources data and cooperates with the U. S. Geological Survey, U. S. Soil Conservation Service, and State Soil Conservation Committee on surface and ground water surveys and chemical quality of waters.

GEORGIA RESOURCES COMMISSION

The Commission is responsible for inventorying the State's water resources and gathering such data as are necessary for determining what further legislation is needed with regard to quantitative control of the State's water resources. A State water engineer, appointed by the Commission is authorized to employ a water resources fact-finding and research staff to be known as the Georgia State Water Survey.

WATER PURVEYORS

The general responsibility for the purity of water is shared by health authorities, water purveyors, owners of property, and water users. Those duties of health authorities and other agencies have been presented. The purveyor of water must safeguard it while in the water supply system, with some overlapping responsibilities with the property owner once the water reaches the property line. Regulations controlling the manufacturing, importing or bottling of water in the Basin are administered by the Georgia State Board of Health.

DESCRIPTION OF THE BASIN

GENERAL

The Altamaha Basin is bounded on the north and northeast by the Savannah Basin and the Ogeechee Basin, on the east by the Atlantic Ocean, on the south by the Satilla and the Suwannee Basins, and on the west by the Chattahoochee and Flint Sub-basins. The Basin watershed comprises 14,148 square miles, all of which is located within Georgia. Approximately 3900 square miles is below the Fall Line in the Coastal Plain Province and the remainder is in the Piedmont Province. The Altamaha River is formed in south central Georgia by the confluence of the Ocmulgee and Oconee Rivers, both of which rise in the Piedmont

Province and receive substantial increments of flow in dry seasons as they cross the upper Coastal Plain. From this point, the river flows southeasterly for approximately 140 miles through a comparatively broad and shallow valley to its delta outlets into the Atlantic Ocean. The Altamaha River is tidal for about 33 miles above its mouth (Figure I-1).

The Oconee River rises at the base of the Chattahoochee Ridge near Gainesville, Georgia, at an elevation of about 1,000 feet and flows in a southeasterly direction across the Piedmont Province into the Coastal Plain to its confluence with the Ocmulgee River at Lumber City, Georgia.

The Ocmulgee River rises at the base of the Chattahoochee Ridge near Atlanta, Georgia, at an elevation of about 1,000 feet and flows in a generally southeasterly direction for about 240 miles and then in a northeasterly direction to its confluence with Oconee River. The South River located at the headwaters of the Ocmulgee Sub-basin receives a substantial part of its base flow from the Atlanta and DeKalb County sewerage systems through Chattahoochee River diversions.

Lloyd Shoals Dam and Jackson Lake regulate the flow of the Ocmulgee River and the Oconee River has minor regulation below Barnett Shoals Dam near Athens and major regulation below Sinclair Dam at Milledgeville. Sinclair Dam regulation affects river flows as far downstream as Doctortown on the Altamaha River.

CLIMATE AND HYDROLOGY

Rainfall is fairly uniform throughout the Basin with the central sections receiving the least amounts. Annual precipitation varies from 47 to 50 inches. Floods occur occasionally and hurricanes pass over the coastal sections at times.

Mean annual temperatures in the Basin vary from 62°F in the upper Piedmont Province to 69°F near the coast. Frost free season in the upper Basin averages 240 days and in the lower sections it is 250 to 280 days.

The Oconee and Ocmulgee Rivers contribute about 5,000 cfs each to the total flow of the Altamaha. A 28 year stream flow record of the Altamaha at Doctortown, Georgia (drainage area approximately 13,600 square miles) indicates an average discharge of 12,600 cfs, a minimum of 1,430 cfs, and a maximum flow on April 18, 1936 of 178,000 cfs (gage height 12.03 ft). The maximum gage height recorded was 14.6 feet in 1925.

GEOLOGY

Three major ground water aquifers are located in the Basin; the crystalline-rock area in the Piedmont Province, and the Cretaceous sand and principal limestone aquifers in the Coastal Plain.

The first of these water-bearing strata serves as a major source of water supply for rural inhabitants of the upper Basin. A large number of wells in the crystalline-rock area are hand dug. Generally, large quantities of ground water are not found below depths of 300 feet and yields differ widely depending on rock type.

Cretaceous sand aquifers yield water at rates up to 2,000 gpm from drilled wells and from 1 to 100 gpm from dug wells. Both artesian and water-table conditions exist, but few large springs are known to issue from Cretaceous strata. Tuscaloosa formations which are predominant in the aquifer are found in thicknesses from 200 to 800 feet and at varying depths increasing in the southern portions. Most well development is within 30 miles of the Fall Line.

The most extensively used single aquifer system in the Southeast River Basins is the principal limestone aquifer which underlies about two-thirds of the Georgia Coastal Plain. Water from this aquifer is found at depths varying from 100 to 500 feet and is of generally good quality; low in silica, iron, and dissolved solids. Practically all municipal and rural water supply in the lower Altamaha Basin is obtained from the principal limestone aquifer.

POPULATION

The 1960 census data show that the population of the Altamaha Basin is 1,040,500, according to figures supplied by the U. S. Study Commission. Approximately 58 percent of the Basin's residents live in cities and towns of 2500 or more population. The large municipalities in the Basin are Atlanta 487,455 (approximately 25 percent lies within the Altamaha Basin); Macon, 69,764; Athens 31,355; Decatur, 22,026 (approximately 40 percent live within the Altamaha Basin); and Warner Robins 18,633. During the period 1950 to 1960, the total Basin population increased more than 13 percent. Urban areas (2,500 or more) increased 40 percent while rural population declined 10 percent during the same period.

RESOURCES

Although the primary economy of the Basin is agriculture, extensive industrial development is also present. Foremost of the farm products are cotton, corn, tobacco, peanuts, vegetables, fruit, and livestock. Many of the Basin industries are related to processing of agricultural products.

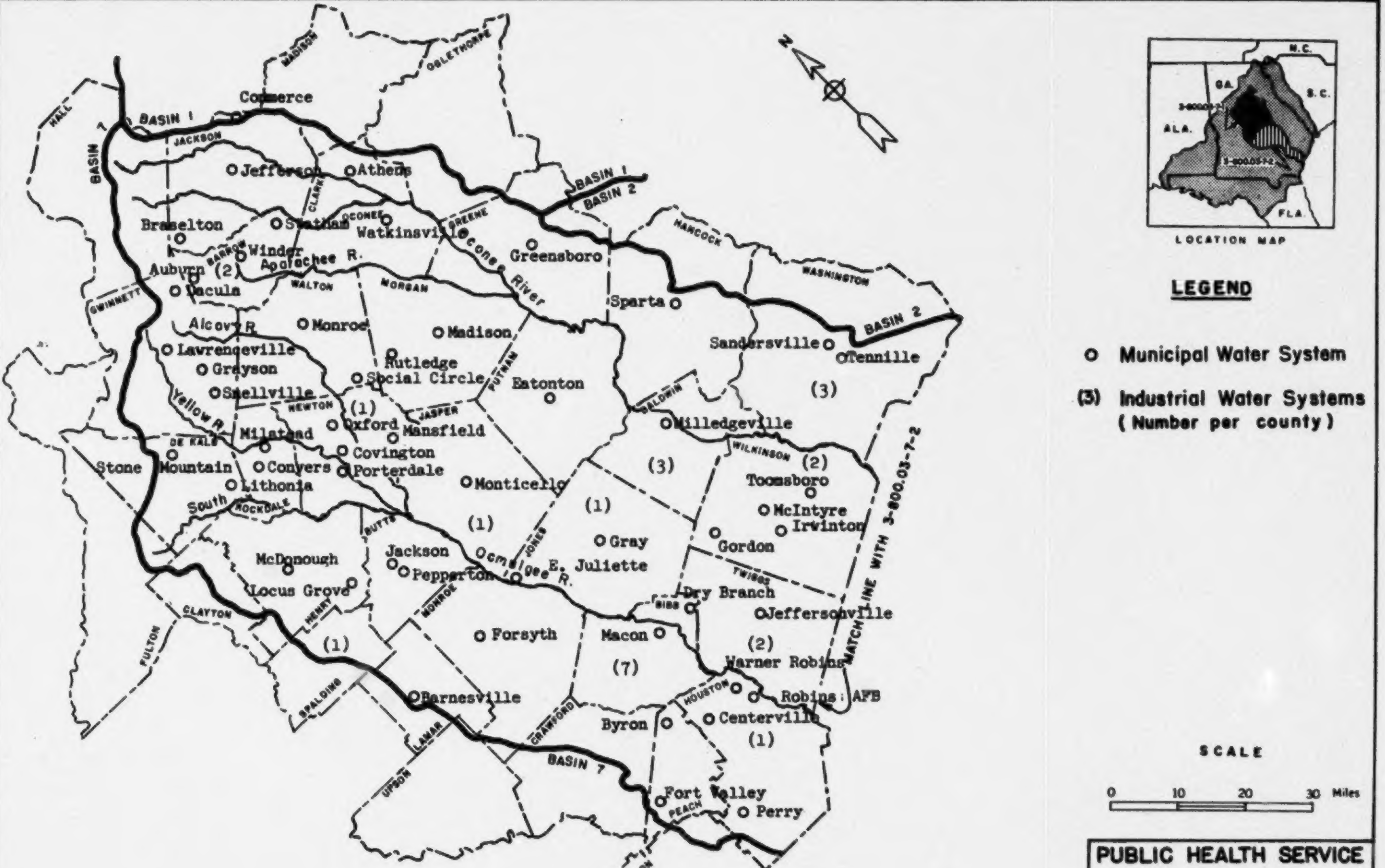
Among the other industries of the Basin are timbers and paper processing, chemicals and allied products, textiles, brick, kaolin and mica mining, and naval stores. Macon, Georgia, is the commercial, industrial, and rail center of the Basin. Dublin, in the south, and Athens, in the north, are also commercial centers. There is some navigation on the Altamaha, but river traffic at present is light.

Lake Sinclair and Jackson Lake are the major recreational attractions in the upper Basin. These reservoirs provide sport fishing, boating, and other aquatic sports. Only the lower portions of the Basin provide appreciable sport fishing on the main streams, but this area is one of the finest fishing areas in the State. Extensive forested swamps bordering much of the Altamaha make this area a haven for ducks, wild trukeys, deer and other wildlife.

W-1

MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES

W-1-a


LOCATION MAP
N.C.
S.C.
GA.
ALA.
FLA.
LEGEND
○ Municipal Water System
(3) Industrial Water Systems (Number per county)
SCALE
0 10 20 30 Miles
N
BASIN 1
BASIN 2
BASIN 7
MATCH LINE WITH 3-800.03-7-2
HALL
JACKSON
MADISON
OGLETHORPE
CLARKE
OCONEE
BARROW
GWINNETT
WALTON
MORGAN
GREENE
HANCOCK
WASHINGTON
NEWTON
JASPER
PUTNAM
BALDWIN
WILKINSON
DE KALB
ROCKDALE
BUTTS
JONES
TWIGGS
BIBB
HENRY
CLAYTON
FULTON
SPALDING
MONROE
LAMAR
UPSON
CRAWFORD
HOUSTON
PEACH
MACON
Commerce
Jefferson
Athens
Braselton
Statham
Watkinsville
Winder
Apalachee R.
Auburn
Dacula
Oconee River
Greensboro
Sparta
Sandersville
Tennille
Alcovy R.
Monroe
Madison
Lawrenceville
Grayson
Snellville
Rutledge
Social Circle
Eatonton
Yellow R.
Milstead
Oxford
Mansfield
Milledgeville
Stone Mountain
Conyers
Covington
Porterdale
Lithonia
Monticello
Toomsboro
South
McIntyre
Irwinton
Gray
Gordon
McDonough
Jackson
Pepperton
Ocmulgee R.
E. Juliette
Locus Grove
Dry Branch
Jeffersonville
Forsyth
Macon
Warner Robins
Barnesville
Robins AFB
Byron
Centerville
Fort Valley
Perry
(1)
(2)
(3)
(7)

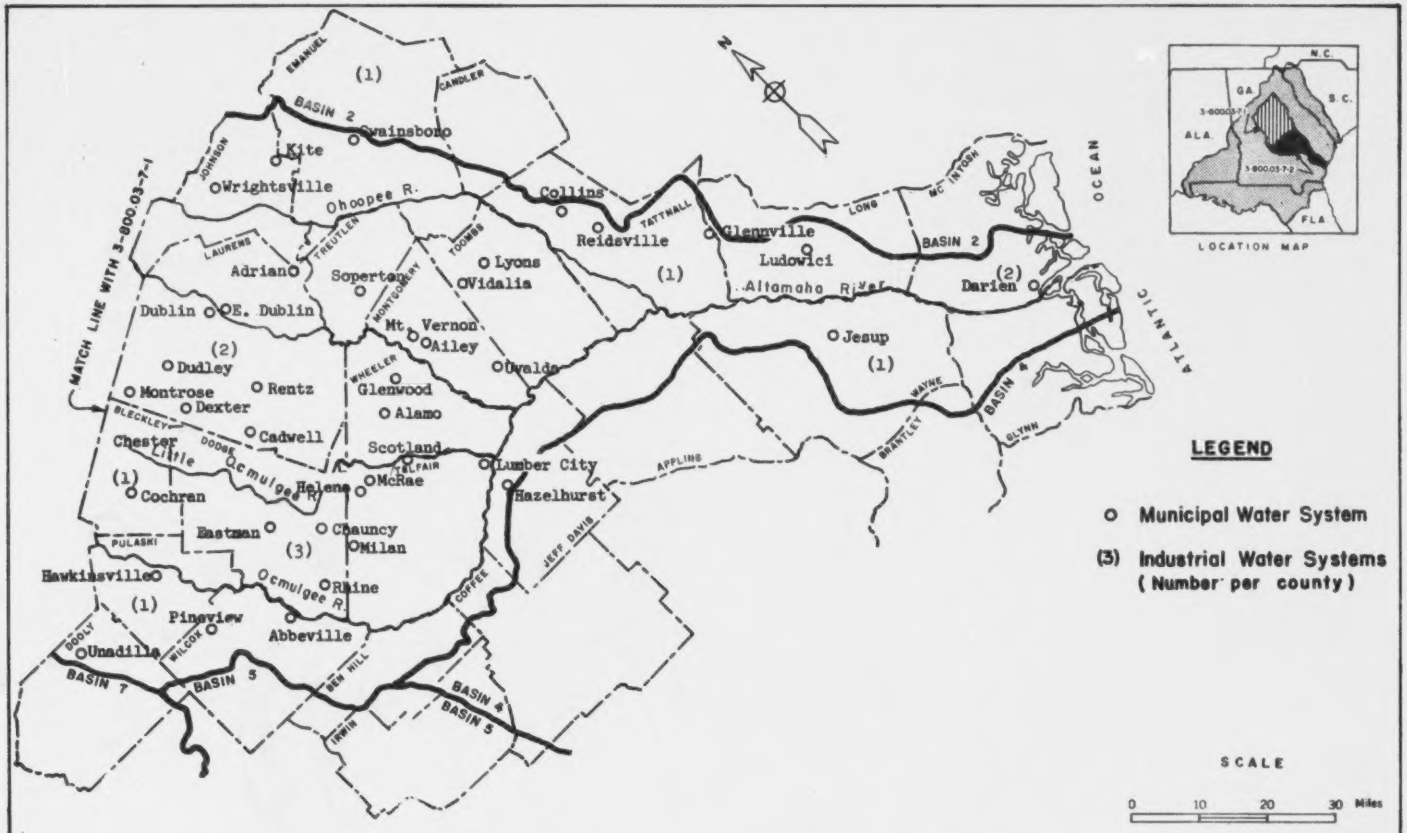
PUBLIC HEALTH SERVICE
REGION IV

ALTAMAHA
BASIN NO. 3

JANUARY 1, 1960

MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FIGURE W-1


LEGEND
○ Municipal Water System
(3) Industrial Water Systems (Number per county)
SCALE
0 10 20 30 Miles
LOCATION MAP
N.C.
S.C.
GA.
ALA.
FLA.
3-800.03-7-1
3-800.03-7-2
OCEAN
ATLANTIC
MATCH LINE WITH 3-800.03-7-1
BASIN 2
BASIN 4
BASIN 5
BASIN 7
EMANUEL
CANDLER
JOHNSON
LAURENS
TREUTLEN
MONTGOMERY
TOOMBS
TATTNALL
LONG
MC INTOSH
WHEELER
BLECKLEY
DODGE
TELFAIR
APPLING
WAYNE
BRANTLEY
GLYNN
JEFF DAVIS
COFFEE
PULASKI
DOOLY
WILCOX
BEN HILL
IRWIN
Swainsboro
Kite
Wrightsville
Ohoopee R.
Collins
Reidsville
Glennville
Ludowici
Lyons
Vidalia
Adrian
Soperton
Dublin
E. Dublin
Mt. Vernon
Ailey
Uvalde
Altamaha River
Darien
Jesup
Dudley
Montrose
Rentz
Dexter
Glenwood
Alamo
Cadwell
Scotland
Chester
Little Ocmulgee R.
Helena
McRae
Lumber City
Hazelhurst
Cochran
Eastman
Chauncy
Milan
Hawkinsville
Ocmulgee R.
Rhine
Pineview
Abbeville
Unadilla
(1)
(1)
(1)
(2)
(2)
(1)
(3)
(1)

MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FIGURE W-1

PUBLIC HEALTH SERVICE
REGION IV

ALTAMAHA
BASIN NO. 3

JANUARY 1, 1960

W-2

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal, industrial, and domestic water supply systems whose source of water is in the Altamaha Basin. Although an attempt was made to collect data on semi-public water supplies, the amount of information was not sufficient to warrant inclusion in this memorandum. Estimated future water requirements in the Basin for the years 1975 and 2000 are also presented, as are suggested solutions to present and anticipated future water supply inadequacies. In connection with these suggested solutions, an appraisal of the benefits to be derived and the annual costs of obtaining water are included.

This memorandum contains no data concerning water requirements of steam-electric generating stations located in the Basin.

PROCEDURES AND INVESTIGATIONS

Existing data on water demand and availability were obtained from reports, records, and correspondence of the Georgia Department of Public Health, the Georgia State Chamber of Commerce, the Georgia Department of Commerce, the U. S. Department of Agriculture, and other Federal and State agencies. Extensive field investigations were conducted by the Georgia Department of Public Health during March, April, and May 1961. The data obtained were submitted to the Public Health Service for inclusion in this memorandum. The field investigations included visits to municipalities, small communities, industries, and institutions.

Data were obtained regarding the municipal water supply systems in the Basin from water plant records, plant operators and officials, and by first-hand observation of plant conditions.

Data on industrial water use were obtained from the municipalities furnishing the water, or when an industrially-owned water supply system was involved, from the industry itself. The location of municipal and industrial water supply systems is shown by Figure W-1.

Little information was available concerning the large number of existing domestic water supply systems. Because limited time and funds would not permit a complete inventory of all domestic water systems, a random sample survey of approximately 500 systems throughout the SERB area was made. The data thus obtained were analyzed and certain conclusions were drawn regarding the average number of persons served by each system, the percentages of the various types of wells and equipment, and the extent of improvements needed. These SERB area averages were applied to the Altamaha Basin.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for communities not listed in census reports. Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960 modified by considerations of changing economic conditions. However, the population projections of urban areas (municipalities of 2500 or more) were adjusted to match projections made by the U. S. Study Commission.

For purposes of this memorandum, future municipal water demands were determined using projected urbanized area populations and estimated per capita water use. The 1975 needs were determined using a water demand of 100 gallons per capita per day (gpcd) in municipalities of under 1,000 persons and 150 gpcd in municipalities of 1,000 or more. The 2000 projections were based on a water demand of 150 gpcd in municipalities of less than 1,000 persons and 200 gpcd in municipalities of 1,000 or more.

The number of domestic (farm and rural non-farm) water users was estimated for 1960, 1975, and 2000. This number was determined by obtaining the difference between the population within the Basin served by municipal water systems and the total population of the Basin. Future domestic water demand was estimated by using 70 gpcd in 1975 and 100 gpcd for 2000. A figure of 4.5 persons per system was used to determine the number of domestic water supply systems. All future systems were assumed to be pressurized.

Projections of industrial water system demands (for those industries receiving all or a portion of their supply from industrially-owned systems) were determined by assuming that water demands will increase or decrease in direct proportion to industrial growth or decline.

January 1, 1960 constant dollars were used for the purpose of estimating annual capital costs, annual operation and maintenance costs, and annual replacement costs of existing and needed water supply systems. An interest rate of 4¼ percent was used for determining annual costs for municipal, domestic, and industrial water supply systems.

Water supply system costs have been estimated on the basis of per capita cost data developed by the Public Health Service and adjusted to the January 1, 1960 Engineering News-Record Construction Cost Index for Atlanta, Georgia.

QUANTITY AND QUALITY OF WATER AVAILABLE FOR WATER SUPPLIES

SURFACE WATER

A description of the major streams in the Basin has been included in the INTRODUCTION of these memoranda.

The availability of surface water quality data in the Altamaha Basin was adequate. Data were obtained from twenty-eight stations - most of which were located in the Ocmulgee and Oconee watersheds on tributary streams. As the report, Water Quality Basic Data - Southeast River Basins, 1961, prepared for the U. S. Study Commission by the Public Health Service shows, total dissolved solids content ranged from 20-109 parts per million (ppm). In general, concentration of individual chemical constituents was low. Only one analysis showed a high iron concentration (1.5 ppm). Hardness was consistently reported below 50 ppm, and alkalinity exceeded this value at only two stations.

To supplement existing surface water quality data, nine temporary sampling stations were established in the Basin by the Public Health Service. Three stations were established in the Oconee Sub-basin, at Athens, Milledgeville, and Dublin; four in the Ocmulgee Sub-basin, at McDonough (South River), Jackson, Macon, and Hawkinsville; and two on the Altamaha River, at Baxley and Doctortown.

In the Oconee Sub-basin, average dissolved oxygen values were consistently above 85 percent of saturation, although summer values at Milledgeville and Dublin fell to 65 and 74 percent respectively. High median coliform values were reported at Athens - 190,000 to 6,800,000 Most Probable Number (MPN) per 100 ml. This station was located directly below several waste outfalls. Median coliform concentration at the other two stations ranged from 8400 to 93,000 MPN per 100 ml.

The Ocmulgee Sub-basin stations showed a wide range of values. Average dissolved oxygen in the polluted South River ranged from 49 (4.3 ppm) to 66 (8.9 ppm) percent of saturation, and median coliform values were found from 8400 to 29,000 MPN per 100 ml. At the other three stations, a minimum average dissolved oxygen of 55 percent (5.0 ppm) of saturation was found at Jackson. Median coliform ranged from high values at Macon of 166,500 to 1,415,000 MPN per 100 ml to lows of 590 to 840 MPN per 100 ml at Jackson. Organic nitrogen in the amount of 1.8 ppm was reported at the McDonough station.

At the two Altamaha River stations, dissolved oxygen was consistently reported above 80 percent of saturation and median coliform values varied from 1215 to 4300 MPN per 100 ml.

GROUND WATER

A total of sixty-nine stations in the Basin have reported ground water quality data. Ground water from the crystalline rock aquifers in the Piedmont Province is available in varying amounts and with widely ranging quality. Total dissolved solids concentrations were reported from 8 to 687 ppm, but generally within the range of 101 to 259 ppm. Hardness was found to be between 14 and 108 ppm, while iron content exceeding 0.3 ppm was reported at six stations.

Below the fall line, ground water is obtained from sand aquifers, and they form principal limestone aquifers where yields exceeding 1000 gpm are found. Analyses available for the sand aquifers seemed inconsistent. Dissolved solids ranged from 25 to 229 ppm with one station reporting a variation of 80 to 227 ppm. Only two stations reported iron content in excess of 0.3 ppm. Other chemical concentrations varied widely.

The analyses of waters from the principal limestone aquifer in the lower part of the Basin were consistent. Total dissolved solids ranged from 155 to 317 ppm and hardness from 95 to 202. Three stations had iron content in excess of 0.3 ppm. Other chemical quality characteristics appeared to be within the normal levels expected of a limestone water.

MUNICIPAL WATER SUPPLIES

INVENTORY

As shown by Table W-1, there are 103 municipal water systems whose source of water is within the Altamaha Basin. These systems serve 391,430 persons in 117 communities and institutions. Four of these systems serve persons outside the Altamaha Basin. Athens, Barnesville, Clayton County, and Commerce serve approximately 12,100 persons in other Basins.

In addition, there are several communities in the Altamaha Basin served by four systems which have water supply sources in the Apalachicola-Chattahoochee-Flint Basin. The water systems of Atlanta, DeKalb County, East Point, and Gwinnett County serve a total of 308,490 persons in Atlanta, Avondale Estates, Decatur, DeKalb County, East Point, Forest Park, Gwinnett County, Hapeville, Norcross, and Pine Lake who are within the Altamaha Basin.

The total population of the Altamaha Basin in 1960 was 1,040,500. The 103 water systems considered by this memorandum and the four systems obtaining water from the Apalachicola-Chattahoochee-Flint Basin together serve a total of 687,820 persons who are within the Altamaha Basin. Average water demand of the 103 water systems shown in Table W-1 is 57.43 mgd or 147 gpcd. Industries which depend on municipal systems for water supply consume 15.5 mgd or 27 percent of the total municipal system output.

PRESENT STATUS OF WATER SYPPLY SYSTEMS

Twelve of the 103 water systems are privately owned and 91 are publicly owned. Twenty-six of the 103 water systems use surface water as the source of municipal supplies (springs are considered to be surface sources). Seventy-three systems obtain water from wells and the remaining four use both surface and ground sources.

The systems using surface water have an average water demand of 39.3 mgd or two-thirds of the total water use. The largest users are Macon (20.0 mgd) and Athens (5.2 mgd). Other systems using over 1 mgd from surface sources are Barnesville (1.0 mgd), Clayton County (1.65 mgd), Milledgeville (1.33 mgd), Milledgeville State Hospital (2.35 mgd), and Monroe (1.30 mgd).

The total use of ground water from wells is 18.13 mgd. The largest users of ground water are Dublin (1.02 mgd), Fort Valley (0.84 mgd), Perry (0.85 mgd), Robins AFB (4.36 mgd), Swainsboro (0.80 mgd), Vidalia (1.50 mgd), and Warner Robins (1.05 mgd). All these users are located in the Coastal Plain Province.

All systems have periodic bacteriological examinations made of the water supplied to the public. Twenty-seven systems have conventional filtration plants with chlorination, 12 have softening or iron removal plants, 21 have simple chlorination only, 4 have chlorination and chemical dosage for corrosion control, and the 39 remaining systems provide no treatment. The untreated supplies have proven bacteriologically satisfactory up to the present time without disinfection. Thirteen systems serving 142,300 persons provide fluoridation.

WATER SUPPLY REQUIREMENTS FOR 1960

Although 51 municipalities reported that improvements to their present water supply system were needed, a study of the basic data indicates that 74 of the water supply systems have source, treatment, storage, or distribution system inadequacies.

The recommended improvements as shown by Table W-2, in terms of cost, include wells for 7 communities, disinfection for 46, iron removal for 9, storage facilities for 23, impoundments or pumps for 11, treatment plant enlargements for 7, and distribution system extensions serving 23,775 additional persons in 31 municipalities.

FUTURE WATER SUPPLY SYSTEM REQUIREMENTS

Table W-3 shows the projected municipal water demands for 1975. It is anticipated that most subdivisions shown in the 1960 inventory will have been incorporated into the adjacent cities by 1975. Lithonia and Stone Mountain in DeKalb County and Dacula, Grayson, Lawrenceville, and Snellville in Gwinnett County are assumed to be served by County Water Systems by 1975. The 91 municipal water systems obtaining water from sources within the Basin in 1975 will have an estimated total water demand of 83.01 mgd and will serve an estimated 488,785 persons. Water supply system improvements in addition to those listed as being needed in 1960 will be required to adequately serve this population. A study of the basic data indicates that source and treatment facilities will be required in 12 municipalities, elevated storage in 26, and expansion of distribution systems to serve an estimated 61,300 persons in 70 communities.

Table W-4 shows the projected municipal water demands for the year 2000. By the year 2000 the 92 municipal water systems obtaining water from sources within the Basin will serve an estimated population of 720,570 persons and the total water demand for this population is estimated to be 145.65 mgd. A study of the basic data indicates that additional improvements of source and treatment facilities will be required in 35 municipalities between 1975 and 2000. Elevated storage will be needed in 48, and expansion of distribution systems to serve an estimated population of 231,800 will be needed in 80 communities.

FUTURE WATER SUPPLY PROBLEMS

It is expected that some municipal water supply systems now utilizing limited supply sources may be confronted with water shortages in the future. It is important that more detailed studies be made of both currently used and alternate ground and surface water sources, and that satisfactory solutions to future water supply needs be forthcoming. Additional studies should also be made concerning increasing pollution problems near major urban areas.

ANNUAL COSTS

The annual cost of providing water to municipal users in the Altamaha Basin in 1960 is estimated to be $5,637,100. This cost, based on the cost of existing facilities, is broken down as follows:

Annual equivalent capital cost	$2,751,900
Annual replacement cost	49,200
Annual operation and maintenance cost	2,836,000
Total annual cost (1960)	$5,637,100

The total capital outlay required to improve the municipal water supply facilities existing in 1960 is estimated to be $5,445,000 as shown by Table W-2. The expenditure of this amount of money will strengthen the existing municipal water systems of the Basin and provide adequate service.

Between 1960 and 1975, additional expenditure will be necessary to improve water supply systems and meet the demands of the increased number of users. The capital cost of providing the additional necessary improvements by 1975 is estimated to be $5,970,000 as shown by Table W-3.

TABLE W-1
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
GEORGIA									
Abbeville	872	860	well	none	0.860	0.050	0.040	46	3
Adrian	568	560	wells	none	0.430	0.079	0.028	50	4
Ailey	469	470	well	none	0.144	0.075	0.040	85	50
Alamo	822	835	wells	none	0.360	0.085	0.055	66	2
Athens[1]	31,355	41,355	Sandy Cr & Oconee R	DcCaNaVtMtp-SoFrsKp	10.000	2.500	5.200	126	40
Auburn	374	375	well	Dh	0.115	0.080	0.020	53	
Barnesville[2]	4,919	6,600	Lake Edie Cr & Lake Towliga Cr	CalMbSoFrs DcV	1.000	1.000	1.000	151	40
Boys Estate (Darien)	--	52	wells	none	0.050	0.005	0.005	100	
Braselton	255	50	wells	none	0.072	0.001	0.003	60	15
Byron	1,138	425	wells	Kp	0.600	0.075	0.019	45	
Cadwell	360	360	well	none	0.144	0.065	0.030	83	
Centerville	290	525	well	AFspDh	0.094	0.060	0.035	67	
Chauncey	330	125	wells	none	0.086	0.002	0.008	64	
Chester	377	275	well	none	0.050	0.018	0.015	55	
Clayton County[3]	--	13,995	Cotton Cr	CaDcIMbSoFrsKp	3.000	0.850	1.650	118	
Cochran	4,714	4,870	wells	DcCalMbSoFrs	0.720	0.185	0.250	51	5
Collins	565	640	well	none	0.570	0.050	0.025	39	
Commerce	3,551	3,820	Turkey Cr & Oconee R	CalDcMbFrs	1.000	0.400	0.750	196	40
Conyers[4]	2,881	3,580	well and Yellow R	CalDcMbSoFrsKp	0.500	0.560	0.350	98	40
Covington[5]	8,167	9,130	Dried Indian Cr	DcCalIMbSoFrs-VsKp	1.500	1.750	0.650	71	19
Trappist Monastery	--	105	wells & spring	Dc (spring only)	0.100	0.135	0.028	270	
Dacula[6]	440	540	well	(Dh)	0.036	0.065	0.030	55	4
Darien	1,569	1,695	wells	none	1.370	0.065	0.150	89	
Dexter	359	350	well	none	0.080	0.035	0.035	100	
Dry Branch									
Ind. Village	75	75	wells	none	undet	0.010	0.006	80	
Twisco Hts. S/D	85	85	well	none	undet	0.001	0.009	110	

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TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
GEORGIA - Cont'd									
Dublin[7]	13,814	15,185	wells	AtCilMpSomFrsDcVs	2.400	0.500	1.020	67	2
Dudley	360	350	wells	DcKp	0.700	0.065	0.070	200	
East Dublin[8]	1,677	1,250	well	AtCsFsDh	0.440	0.100	0.065	52	
East Juliette	201	260	Ocmulgee R	CaMtSoFrsKp(Dh)	0.150	0.092	0.048	184	50
Eastman	5,118	5,250	wells	VsDc	2.000	0.200	0.600	115	3
Ind. Village	375	375	well	Dh	0.800	0.050	0.038	100	5
Eatonton	3,612	3,640	Rooty Cr	Ca(Tc)MbSoFrsKpVsDc	0.500	0.525	0.400	110	35
Forsyth	3,697	4,695	Tobosofkee Cr	CalTcMpSoFrsKpVtDc	1.000	0.220	0.400	86	
Fort Valley	8,310	9,810	wells	AcDcKpcMpVs	3.000	0.935	0.840	86	30
Glennville	2,791	3,875	wells	none	1.800	0.300	0.285	100	
Glenwood	682	680	well	none	0.150	0.075	0.038	56	
Gordon #1	1,793	1,550	wells	none	0.940	0.025	0.100	64	40
#2		375	well	none	0.130	0.050	0.070	186	
Gray	1,320	1,510	well	IAsClMbSoFrsDc	0.300	0.091	0.065	43	
Grayson	282	320	well	Fsp(Dh)	0.043	0.060	0.020	63	
Greensboro	2,773	2,885	well & Richland Cr	CalDcTsMbSoFrsKp	1.000	0.200	0.187	65	4
Hawkinsville	3,967	3,970	wells	Dc	undet	0.550	0.450	113	7
Hazelhurst	3,699	4,040	wells	Dc	undet	0.185	0.200	50	
Helena	1,290	1,330	well	none	0.580	0.075	0.011	83	
Irwinton	673	840	wells	(KcDh)	0.280	0.015	0.055	66	
Jackson	2,545	2,625	Yellow Water Cr	CalDcMbSoFrsKp	0.500	0.230	0.357	135	5
Jefferson	1,746	2,195	Currey Cr	CalDcMbSoFrs	0.864	1.250	0.500	230	70
Jeffersonville	1,013	1,515	wells	none	0.420	0.083	0.100	66	
Jesup	7,304	7,350	wells	Dc	3.200	0.280	0.570	78	
Kite	424	400	well	none	undet	0.002	0.020	50	
Lawrenceville[6]	3,804	4,000	wells	Dc	0.750	0.305	0.283	--	
Lithonia	1,667	2,065	Pole Creek	CalMbSoFrsKpDc	0.250	0.260	0.150	73	7
Norris Lake S/D	150	150	well	(Dh)	0.072	0.005	0.015	100	
Locust Grove	369	420	Davis Spring	none	1.100	0.070	0.030	72	

(3/15/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
GEORGIA - Cont'd									
Ludowici	1,578	1,580	well	none	0.570	0.040	0.140	89	
Lumber City	1,360	1,350	well	none	undet	0.075	0.125	93	
Lyons	3,219	3,320	well	none	undet	0.250	0.200	60	4
McDonough	2,224	3,425	wells & Walnut Cr	CalMtbFrsKpDc	0.380	0.175	0.360	105	10
McIntyre	316	560	well	Fsp(Dh)	0.360	0.100	0.040	72	10
McRae	2,738	2,740	wells	Dc	1.220	0.152	0.351	128	7
Macon	69,764	72,765	Ocmulgee R	CalNgDcMpSbFrsKp	45.000	10.000	20.000	275	50
Cochran Field	350	370	wells	Dc	1.150	0.400	0.300	81	
Madison	2,680	3,080	2 Mile Branch	CalMbSoFrsKpDc	0.500	0.390	0.200	65	
Mansfield	394	400	wells	(Fps)	0.144	0.065	0.015	38	
Metro. Mobile Homes (Norcross)	250	250	wells	none	0.039	0.001	0.014	56	
Milan	786	865	wells	none	0.670	0.075	0.065	56	
Milledgeville	11,117	11,265	Oconee R	CalTcMtbSoFrsKpDc	2.000	undet	1.330	118	11
State Hospital[9]	--	16,160	Oconee R	Ca(Td)DcMtSoFrsKp	3.000	3.230	2.347	145	
Colony Farm	--	350	Spring	none	undet	0.050	0.040	114	
Monroe	6,826	6,900	Jack's Creek	CalDcIMbSoFrsKpVt	2.000	0.751	1.300	189	
Monticello	1,931	2,130	Pope's Branch	CasMbSoFrsDcKpVt	0.500	0.575	0.210	100	
Montrose	236	245	wells	Dh	0.100	0.025	0.017	70	
Mount Vernon	1,166	1,150	wells	none	undet	0.075	0.070	61	14
Pepperton	523	525	well	AtCsDc	0.290	0.175	0.120	230	50
Perry	6,032	6,010	wells	AtClMbVsSoFraDc	2.000	0.775	0.850	140	
Pineview	369	350	well	Dh	undet	0.060	0.022	63	
Porterdale	2,365	2,365	Yellow R	CaDcMptSoFrsKp	1.650	1.205	0.900	380	46
Reidsville	1,229	1,305	well	none	undet	0.052	0.075	58	
Reidsville Prison	3,400	3,400	wells	(Dc)	1.680	0.100	0.600	176	
Rentz	307	300	well	(Dh)	0.086	0.060	0.015	50	
Rhine	485	500	well	none	undet	0.060	0.035	70	

(3/15/62)

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TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
GEORGIA - Cont'd									
Robins AFB	10,000	10,000	wells	KpcDcV	12.400	1.650	4.360	--	
Rutledge	478	480	wells	none	0.068	0.035	0.040	85	
Sandersville	5,425	5,400	wells	Dc	1.800	0.190	0.500	92	10
Scotland	236	200	wells	none	0.220	0.060	0.020	100	
Snellville	468	475	wells	Dc	undet	0.115	0.050	105	
Social Circle #1	1,780	1,925	Gibbs Cr	CalDcMbSoFrsKp	0.300	0.120	0.193	100	
#2	--	250	Spring	DcKp	undet	0.025	0.013	52	
Soperton	2,317	2,260	wells	none	1.000	0.125	0.100	44	
Sparta	1,921	1,960	well	DcCaMbSoFrsKp	0.268	0.175	0.106	54	20
Statham	711	725	Spring	none	0.145	0.060	0.055	76	6
Stone Mountain	1,976	1,800	Mountain Cr & Popular Spring	CalMbSoFrsDc	0.215	0.515	0.120	67	
Swainsboro	5,943	6,800	wells	Dc	2.300	0.565	0.800	119	30
Tennille	1,837	1,300	well	none	undet	0.040	0.098	75	
Toomsboro	764	690	wells	none	0.145	0.050	0.050	73	10
Unadilla	1,304	1,345	wells	none	0.500	0.210	0.175	130	9
Uvalda	589	550	well	(Dh)	0.290	0.060	0.045	82	
Vidalia	7,569	7,795	wells	Dc	3.600	0.600	1.500	193	
Warner Robins	18,633	21,600	wells	AmDcKpVs	2.500	1.300	1.050	49	
Watkinsville	758	795	Calls Cr	CalTcDcMbSoFrsKp	0.144	0.222	0.100	126	15
Winder	5,555	5,755	Cedar Cr	CalToMbSbFrsKpDc	1.000	undet	0.700	121	
Wrightsville	2,056	2,000	wells	none	1.100	0.350	0.200	100	
Totals		391,430					57.430	147	27 (15.5 mgd)

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[1] Serves adjacent areas including Winterville, Whitehall, and Bogart
[2] Serves Aldora
[3] Serves Jonesboro, Stockbridge, Morrow, Mountain View, and Lake City
[4] Serves Milstead
[5] Serves Oxford
[6] Also served by Gwinnett County Water System
[7] Serves Veterans Administration Hospital
[8] Serves Juliette
[9] Serves 3500 in Midway-Hardwick (Baldwin County)

(3/15/62)

TABLE W-2
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
ALTAMAHA BASIN

Municipality	Estimated Costs in $1,000 Source	Treatment	Storage	Dist. System	Total
GEORGIA					
Abbeville	--	2	--	1	3
Adrian	--	2	--	--	2
Ailey	--	2	--	--	2
Alamo	--	2	--	2	4
Athens	--	--	132	1,000	1,132
Auburn	--	2	--	--	2
Barnesville	6	115	--	--	121
Boy's Estate	--	2	--	--	2
Braselton	12	2	41	62	117
Byron	--	8	--	45	53
Cadwell	--	2	--	--	2
Chauncey	--	4	22	12	38
Chester	12	4	30	6	52
Clayton County	25	526	1,360	--	1,911
Cochran	--	8	--	3	11
Collins	--	2	--	--	2
Conyers	--	8	--	18	26
Commerce	6	212	--	--	218
Darien	--	8	--	--	8
Dexter	--	2	--	--	2
Dry Branch					
Ind. Village	--	2	--	--	2
Twisco Hts S/D	--	2	18	--	20
East Dublin	--	--	--	29	29
East Juliette	2	2	--	--	4
Eastman	--	--	35	--	35
Elberta	12	2	27	39	80
Forsyth	5	--	--	--	5
Glennville	5	8	--	1	14
Glenwood	--	2	--	--	2
Gordon	--	8	--	--	8
Greensboro	15	--	41	--	56
Helena	--	8	--	--	8
Irwinton	--	4	48	2	54
Jackson	6	115	35	--	156
Jeffersonville	--	16	--	--	16
Jesup	--	--	--	6	6
Kite	6	2	22	1	31

TABLE W-2 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
ALTAMAHA BASIN

Municipality	Estimated Costs in $1,000				
	Source	Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd					
Lawrenceville	--	20	--	--	20
Lithonia	--	--	35	--	35
Locust Grove	--	2	--	--	2
Ludowici	12	8	35	--	55
Lumber City	--	16	--	--	16
Lyons	--	8	--	--	8
McDonough	--	50	82	2	134
McIntyre	--	8	--	--	8
McRae	--	30	--	--	30
Madison	--	--	70	--	70
Mansfield	--	12	--	1	13
Metro.Mobile Homes (Norcross)	--	2	18	10	30
Milan	--	2	--	20	22
Milledgeville	--	180	--	--	180
State Hospital	11	--	22	--	33
Colony Farm	--	2	--	--	2
Monroe	50	--	--	2	52
Mount Vernon	--	16	--	--	16
Pineview	--	--	18	1	19
Reidsville	12	16	--	--	28
Reidsville Prison	--	8	48	--	56
Rentz	--	2	--	--	2
Rhine	--	2	18	--	20
Rutledge	--	4	--	--	4
Sandersville	24	16	82	2	124
Scotland	--	2	--	2	4
Social Circle	--	--	--	20	20
Soperton	--	16	--	4	20
Statham	12	8	--	--	20
Stone Mountain	--	--	--	17	17
Swainsboro	12	--	--	9	21
Tennille	--	8	--	32	40
Toomsboro	--	10	--	4	14
Unadilla	5	8	--	--	13
Uvalda	--	--	--	2	2
Watkinsville	2	--	48	--	50
Wrightsville	--	8	--	3	11
Totals	252	1,546	2,287	1,360	5,445

*Based on January 1960 constant dollars.
(3/15/62)

TABLE W-3
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA						
Abbeville	850	0.085	--	--	--	--
Adrian	680	0.068	--	--	7	7
Ailey	490	0.050	--	--	--	--
Alamo	950	0.095	--	--	8	8
Allentown	600	0.060	14	32	36	82
Athens	48,000	7.200	--	132	400	532
Auburn	475	0.048	--	--	6	6
Barnesville	7,480	1.122	--	--	50	50
Boy's Estate	75	0.008	--	--	--	--
Braselton	300	0.030	--	--	3	3
Byron	2,165	0.325	--	27	60	87
Cadwell	475	0.048	--	--	7	7
Centerville	525	0.053	--	--	--	--
Chauncey	300	0.030	--	--	--	--
Chester	450	0.045	--	--	4	4
Clayton County	21,000	3.150	--	--	492	492
Cochran	5,200	0.780	12	48	29	89
Collins	640	0.064	--	--	--	--

(3/15/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Commerce	4,175	0.830	--	--	21	21
Conyers	4,500	0.675	65	53	37	155
Covington	10,460	1.569	--	--	75	75
Trappist Monastery	110	0.030	--	--	--	--
Darien	2,130	0.320	--	35	26	61
Dexter	370	0.037	--	--	--	--
Dry Branch	175	0.018	--	--	--	--
Dublin	16,600	2.490	12	132	84	228
Dudley	430	0.070	--	--	4	4
East Dublin	1,800	0.270	--	--	7	7
East Juliette	260	0.050	--	--	--	--
Eastman	5,400	0.810	--	35	17	52
Eatonton	3,800	0.570	--	--	11	11
Elberta	750	0.075	--	--	6	6
Forsyth	4,695	0.700	--	30	54	84
Fort Valley	9,810	1.470	--	--	17	17
Glennville	3,000	0.450	--	--	7	7
Glenwood	750	0.075	--	--	4	4
Gordon	2,200	0.330	--	40	24	64

(3/15/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Gray	1,875	0.280	--	27	35	62
Greensboro	3,300	0.500	--	--	26	26
Hawkinsville	4,300	0.645	--	--	20	20
Hazelhurst	4,840	0.726	--	35	48	83
Helena	1,500	0.225	--	--	13	13
Irwinton	900	0.090	--	--	4	4
Jackson	2,780	0.420	--	27	9	36
Jefferson	2,350	0.540	--	--	9	9
Jeffersonville	1,725	0.260	--	25	13	38
Jesup	8,000	1.200	--	50	42	92
Kite	435	0.044	--	22	--	22
Locust Grove	435	0.044	--	--	--	--
Ludowici	2,000	0.300	--	--	25	25
Lumber City	1,550	0.233	--	--	11	11
Lyons	3,900	0.585	--	--	35	35
McDonough	3,800	0.570	--	--	23	23
McIntyre	680	0.068	--	--	7	7
McRae	3,200	0.480	--	--	28	28
Macon	135,000	27.000	--	500	988	1,488

(3/15/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Madison	3,500	0.525	--	--	25	25
Mansfield	380	0.038	--	--	--	--
Milan	1,060	0.159	--	--	16	16
Milledgeville	12,500	1.875	--	50	83	133
State Hospital	20,700	3.100	--	100	272	372
Monroe	7,100	1.065	--	--	16	16
Monticello	2,300	0.345	--	--	10	10
Montrose	250	0.025	--	--	--	--
Mt. Vernon	1,430	0.215	--	--	16	16
Pepperton	600	0.138	--	--	5	5
Perry	7,000	1.050	--	--	60	60
Pineview	380	0.038	14	--	--	14
Porterdale	2,500	0.950	--	--	8	8
Reidsville	1,640	0.246	--	30	20	50
Reidsville Prison	3,400	0.600	--	--	--	--
Rentz	310	0.030	14	18	--	32
Rhine	515	0.052	14	--	--	14
Robins AFB	10,000	4.360	--	--	--	--
Rutledge	750	0.075	20	--	16	36
Sandersville	5,600	0.840	--	--	10	10

(3/15/62)

TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000 Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Scotland	250	0.025	--	--	--	--
Social Circle	2,200	0.330	120	35	--	155
Soperton	2,600	0.390	--	45	17	62
Sparta	2,100	0.315	75	27	12	114
Statham	830	0.083	--	--	7	7
Swainsboro	8,200	1.230	--	48	75	123
Tennille	1,930	0.123	--	--	6	6
Toomsboro	820	0.082	--	--	3	3
Unadilla	1,400	0.210	--	--	3	3
Uvalda	630	0.063	--	--	2	2
Vidalia	8,400	1.260	--	--	38	38
Warner Robins	23,000	3.450	218	--	76	294
Watkinsville	1,010	0.152	70	--	15	85
Winder	6,200	0.930	--	40	27	67
Wrightsville	2,200	0.330	--	--	9	9
Totals	488,785	83.010	648	1,643	3,679	5,970

*Based on January 1960 constant dollars.

(3/15/62)

TABLE W-4

MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA						
Abbeville	700	0.105	--	--	--	--
Adrian	920	0.138	--	--	14	14
Ailey	530	0.080	--	--	3	3
Alamo	1,200	0.240	--	--	15	15
Allentown	800	0.120	--	--	12	12
Athens	60,000	12.000	380	1,020	720	2,120
Auburn	715	0.105	--	--	14	14
Barnesville	9,680	1.936	115	--	132	247
Boy's Estate	150	0.015	--	--	--	--
Braselton	380	0.057	--	--	5	5
Byron	4,000	0.800	22	58	110	190
Cadwell	760	0.114	--	--	17	17
Centerville	525	0.100	--	--	13	13
Chauncey	250	0.038	--	--	--	--
Chester	600	0.090	--	--	9	9
Clayton County	124,000	24.000	2,000	100	6,180	8,280
Cochran	8,000	1.600	212	82	168	462
Collins	650	0.098	--	--	5	5
Commerce	4,500	0.900	--	--	20	20
Conyers	6,700	1.340	150	82	144	376

(3/15/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Covington	14,400	2.880	300	82	236	618
Trappist Monastery	110	0.030	--	--	--	--
Darien	3,130	0.626	--	48	60	108
Dexter	400	0.060	--	--	3	3
Dry Branch	175	0.035	--	--	--	--
Dublin	20,000	4.000	225	132	288	645
Dudley	575	0.086	--	--	9	9
East Dublin	2,400	0.480	12	40	36	88
East Juliette	260	0.050	--	--	--	--
Eastman	7,500	1.500	--	70	126	196
Eatonton	6,000	1.200	120	--	132	252
Elberta	1,000	0.200	12	35	15	62
Forsyth	7,000	1.400	120	82	144	346
Fort Valley	10,000	2.000	--	82	84	166
Glennville	5,000	1.000	--	--	126	126
Glenwood	865	0.130	--	--	7	7
Gordon	2,800	0.560	--	40	36	76
Gray	2,400	0.480	90	41	31	162
Greensboro	4,000	0.800	--	48	42	90

(3/15/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Hawkinsville	6,000	1.200	12	35	102	149
Hazelhurst	6,800	1.368	12	70	120	202
Helena	1,900	0.380	--	35	24	59
Irwinton	1,000	0.200	--	--	7	7
Jackson	3,900	0.780	--	48	24	72
Jefferson	2,550	0.587	--	--	12	12
Jeffersonville	2,200	0.440	12	41	29	82
Jesup	10,000	2.000	--	85	120	205
Kite	450	0.068	--	--	2	2
Locust Grove	465	0.070	--	--	6	6
Ludowici	3,600	0.720	12	58	94	164
Lumber City	1,900	0.380	12	35	21	68
Lyons	5,900	1.180	--	58	120	178
McDonough	5,200	1.040	120	27	84	231
McIntyre	980	0.147	--	--	18	18
MaRae	4,200	0.840	20	58	60	138
Macon	168,000	33.600	--	520	1,980	3,500
Madison	4,400	0.880	120	--	54	174
Mansfield	250	0.038	--	--	--	--

(3/15/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Milan	1,730	0.347	--	27	40	67
Milledgeville	18,000	3.600	330	132	330	792
State Hospital	29,200	5.840	537	153	510	1,200
Monroe	10,000	2.000	--	70	174	244
Monticello	2,700	0.540	65	--	24	89
Montrose	260	0.039	--	--	--	--
Mt. Vernon	2,000	0.400	20	40	34	94
Nicholson	1,000	0.150	20	35	60	115
Pepperton	700	0.161	--	--	6	6
Perry	10,000	2.000	--	60	180	240
Pineview	400	0.060	--	--	2	2
Potterdale	3,500	1.330	--	--	60	60
Reidsville	2,400	0.480	15	45	47	107
Reidsville Prison	3,400	0.680	--	--	--	--
Rentz	320	0.048	--	--	--	--
Rhine	550	0.083	--	18	3	21
Robins AFB	10,000	4.360	--	--	--	--
Rutledge	1,600	0.320	35	41	51	127
Sandersville	8,500	1.700	15	58	126	199

(3/15/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
ALTAMAHA BASIN

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
GEORGIA - Cont'd						
Scotland	270	0.040	--	--	2	2
Social Circle	2,250	0.450	--	35	4	39
Soperton	3,800	0.760	15	50	72	137
Sparta	2,400	0.480	--	40	18	58
Statham	1,070	0.214	20	18	15	53
Swainsboro	9,500	1.900	--	70	78	148
Tennille	2,100	0.420	12	48	10	70
Toomsboro	920	0.138	--	--	6	6
Unadilla	1,500	0.300	--	--	6	6
Uvalda	710	0.105	--	--	5	5
Vidalia	10,000	2.000	--	80	108	188
Warner Robins	25,000	5.000	310	130	120	560
Watkinsville	1,630	0.326	--	--	38	38
Winder	7,700	1.540	120	70	90	280
Wrightsville	2,600	0.520	--	--	--	--
Totals	720,570	145.648	5,592	4,332	14,076	24,000

*Based on January 1960 constant dollars.

(3/15/62)

This includes $648,000 for improvement of sources and treatment, $1,643,000 for storage facilities, and $3,679,000 for distribution facilities.

The annual cost of providing water to municipal users in 1975 is estimated to be $7,477,600. This includes annual equivalent capital cost of: (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on total investment as of 1975, and the operation and maintenance cost is based on the total installed systems as of 1975. A breakdown of this annual cost is given below.

Annual equivalent capital cost	$3,306,100
Annual replacement cost	80,500
Annual operation and maintenance cost	4,091,000
Total annual cost (1975)	$7,477,600

Between 1975 and 2000, municipal growth will make necessary an additional estimated capital expenditure of $24,000,000 to raise the water supply facilities to the necessary capacity. This includes $5,592,000 for source improvement and treatment facilities, $4,332,000 for storage capacity, and $14,076,000 for extension of distribution facilities.

The annual cost of providing water to municipal users in 2000 is estimated to be $11,826,600 assuming that all needs have been met by the year 2000. A breakdown of this annual cost is given below:

Annual equivalent capital cost	$4,471,600
Annual replacement cost	94,500
Annual operation and maintenance cost	7,260,500
Total annual cost (2000)	$11,826,600

BENEFITS

Storage for municipal water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obtained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

(6/1/62)

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Because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the future, from public or private sources in the Basin, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established is estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for municipal use included in any multi-purpose project constructed in the Basin would be at least equal to the cost of developing alternative sources.

DOMESTIC WATER SUPPLIES

INVENTORY

The methods for obtaining basic data on domestic water supply systems have been outlined previously in the PROCEDURES AND INVESTIGATIONS section of this memorandum.

The number of persons in the Basin served by existing municipal water supply systems is estimated to be 687,820. The remainder of the Basin population of 352,680 persons is assumed to be served by domestic water supply systems. Average per capita water demand is 50 gallons per day which indicates a total existing domestic water demand of 17.6 mgd.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Based on the analysis of the SERB area wide random-sample survey of domestic supplies, it is estimated that there are 78,370 domestic water supply systems in the Altamaha Basin. Of this total, 27,200 systems have drilled wells, 37,800 have dug wells, 4,100 have bored wells, 5,000 have driven wells, and 4,270 have springs.

It is estimated that 6,400 systems have an insufficient source of supply and another 18,700 have sources of improper construction. There are 57,000 supplies which have pressure systems and the remaining 21,370 supplies use hand pumps or buckets. There are 47,500 systems which do not meet accepted health standards and 21,000 systems have water quality problems, the most significant of which are hardness and high iron concentration.

WATER SUPPLY SYSTEM REQUIREMENTS FOR 1960

In order to provide a safe, potable supply of water for human consumption, certain minimum improvements will be needed for many of the existing domestic systems. These improvements consist of development of new sources for those systems which have either sources of insufficient yield or sources of improper construction. Systems which presently use hand pumps or buckets should install pressure systems and those systems which do not meet health standards because of improper construction will need seals and covers. Softening or other treatment of those sources which have water quality problems is also needed. In addition, approximately 23,775 persons now served by domestic systems should connect to municipal water supply systems. Costs for providing these needs are listed below.

Total capital outlay to improve existing domestic water supply systems to accepted health standards is estimated to be $36,200,000. This includes development of 25,000 new sources, sanitary seals and covers for 47,500 systems, 22,300 pressure systems, and 20,800 treatment facilities.

FUTURE WATER SYSTEM REQUIREMENTS

In determining future requirements it was assumed that all domestic water supply systems in the future will be pressurized and will meet accepted health standards. By 1975, it is estimated that a total of 85,200 domestic systems serving 383,400 persons will be in existence in the Altamaha Basin. This will require construction of 6,830 complete, new systems (wells, seals and covers, pressurization) and treatment for about 27 percent of the systems. Total cost of the new systems is estimated to be $8,767,700 based on 1960 constant dollars. This cost includes $8,204,100 for wells, seals and covers, and pressure systems and $563,600 for treatment facilities.

By 2000, an estimated 171,600 persons will be served by a total of 38,100 domestic water supply systems which will result in the abandonment of 47,100 systems between 1975 and 2000.

Average domestic water demand by 1975 will be 26.8 mgd, based on 70 gpcd and in 2000 it will be 17.2 mgd based on 100 gpcd.

ANNUAL COSTS

For the purposes of this memorandum it is assumed that present and future needs of the domestic water systems will be met on an individual basis.

The annual cost of providing domestic water from existing systems is estimated to be $5,370,000, based on an estimated existing capital investment of $61,842,700. A breakdown of the annual cost is given below:

Annual equivalent capital cost	$3,003,100
Annual replacement cost	1,422,400
Annual operation and maintenance cost	944,500
Total annual cost (1960)	$5,370,000

The annual cost of providing water for domestic water supply systems in 1975 is estimated to be $8,886,200 based on an estimated total investment of $106,810,400. A breakdown of annual cost for 1975 is given below:

Annual equivalent capital cost	$5,186,700
Annual replacement cost	2,461,000
Annual operation and maintenance cost	1,238,500
Total annual cost (1975)	$8,886,200

The annual cost of providing water for the domestic systems expected to exist in 2000 is estimated to be $3,728,000. A breakdown of annual cost for the year 2000 is given below:

Annual equivalent capital cost	$2,177,000
Annual replacement cost	1,031,000
Annual operation and maintenance cost	520,000
Total annual cost (2000)	$3,728,000

INDUSTRIAL WATER SUPPLIES

INVENTORY

Data secured by field surveys of 36 industrially-owned water systems are shown in Table W-5. Only those industries with their own source of water were surveyed, although 13 of the industries shown in Table W-5 supplement their supplies with water from municipal water systems. The 36 industries surveyed use 78.25 mgd from their own sources, and the total amount of water supplied to all industries by municipal systems is 15.50 mgd as shown in the MUNICIPAL WATER SUPPLIES section of this memorandum. Thus, the total industrial water use in the Basin is approximately 93.75 mgd. The pulp and paper industry is the largest user of water. The two pulp and paper plants use 56.35 mgd or 72 percent of the total water demand. Ten of the 36 industries surveyed were mining operations using 11.10 mgd, and eight industries were textile plants using 6.50 mgd.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Six of the industries surveyed obtain water (not including that from municipal systems) from surface sources only, 22 obtain water from wells only, and 8 obtain water from both wells and surface sources. The total use from wells is 52.57 mgd and the total use from surface sources is 25.68 mgd. No industry reported that the existing source of water was inadequate to meet demands.

Four of the industries provide disinfection only, one provides iron removal and one provides softening for water used for drinking and sanitation. Nine industries reported treatment of water used for processing and boiler use. Process and boiler water was softened at

3 of the plants, 4 of the plants used complete treatment, and one provided chlorination and settling. One plant disinfected water used for processing. Eight plants reported treating water for cooling. Four plants used complete treatment for cooling water, one softened, one provided chlorination and settling, and two used disinfection only.

No attempt was made to determine consumptive water use by industry; however, it is believe to be relatively small.

FUTURE WATER SUPPLY REQUIREMENTS FOR 1975 AND 2000

Industrial water use from industrially owned sources by 1975 and 2000 is estimated to be 112.25 mgd and 162.43 mgd respectively. Table W-6 gives the projected water demands and water system needs (in terms of cost) for 1975 and 2000.

Between 1960 and 1975, industrial water supply system needs for existing and new plants will include installation of 10 wells, one surface water intake, 2 chlorinators, and a 20 mgd conventional filter plant, and 4 storage facilities.

Industrial development will have expanded between 1975 and 2000 to the point that water supply system needs will include provision of 20 new wells, 5 intake enlargements, 12 storage facilities, 1 chlorinator, and additions to 2 conventional filter plants.

FUTURE WATER SUPPLY PROBLEMS

No significant industrial water supply problems, from the standpoint of quantity and quality, are expected in the future. However, due to the large ground water withdrawal and resulting deep cone of depression in the Jesup area, all additional water by industry in this area is expected to be met by surface water supplies.

ANNUAL COSTS

Existing industrial water supply systems are reported to be adequate for 1960 needs. The annual cost of providing industrial water in 1960 from existing supplies is estimated to be $1,894,400. A breakdown of this cost, based on the cost of existing facilities, is given below:

Annual equivalent capital cost	$ 277,600
Annual replacement cost	16,800
Annual operation and maintenance cost	1,600,000
Total annual cost (1960)	$1,894,400

Between 1960 and 1975, the capital outlay required to meet the increased water demand by industry is estimated to be $2,770,000 as shown by Table W-6.

The annual cost of providing the industrial water required in 1975 is estimated to be $3,068,600. This includes annual equivalent capital costs of existing facilities in 1960, and facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on the total investment as of 1975, and the operation and maintenance cost is based on the total installed systems as of 1975. A breakdown of these costs is given below:

Annual equivalent capital cost	$ 412,100
Annual replacement cost	18,900
Annual operation and maintenance cost	2,637,600
Total annual cost (1975)	$3,068,600

Between 1975 and 2000, the capital outlay required to meet the increased water demand by industry is estimated to be $6,291,000 as shown by Table W-6.

The annual cost of providing the industrial water needed by 2000 is estimated to be $4,862,200 assuming that all the needs have been met by the year 2000. A breakdown of this cost is given below:

BENEFITS

Storage for industrial water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obtained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

Because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the future, from public or private sources in the Basin, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established is estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for industrial use included in any multi-purpose project constructed in the Basin would be at least equal to the cost of developing alternative sources.

TABLE W-5
BASIC DATA ON INDUSTRIAL WATER SUPPLY SYSTEMS
ALTAMAHA BASIN

Location by State and County	Code	Type of Industry	Number of Employees	Drinking and Sanitation			Processing and Boiler			Cooling			Total Plant Demand mgd
				Source	Treatment	Average mgd	Source	Treatment	Average mgd	Source	Treatment	Average mgd	
GEORGIA													
Baldwin	A	brick	50	well	undet	*	well	undet	*	pond	undet	*	0.022
	B	textile	75	city & well	--	--	city & well	--	--	city & well	--	--	undet
	D	textile	1,142	city	--	--	Oconee R	complete	1.600	Oconee R	complete	0.100	1.700
Barrow	E	food	150	wells	undet	*	wells	undet	*	wells	undet	*	0.350
	F	metal	60	wells	undet	*	wells	undet	*	wells	undet	*	0.040
Bibb	G	fiber board	1,000	city	--	--	wells	undet	*	wells	undet	*	1.680
	I	food	36	city	--	--	city	--	--	Ocmulgee R	undet	0.100	0.100
	J	chemical	31	city	--	--	city	--	--	Ocmulgee R	undet	0.140	0.140
	L	mining	80	city	--	--	city	--	--	well	undet	0.072	0.072
	M	pulp & paper	550	well	undet	0.050	Ocmulgee R	chlor & settling	*	Ocmulgee R	chlor & settling	*	15.350
	N	chemical	60	city	--	--	city	--	--	Walnut Cr	undet	0.070	0.070
	P	metal fab	750	city	--	--	well	undet	0.200	--	--	--	0.200
Bleckley	Q	food	10	well	none	*	well	none	*	well	none	*	0.100
Dodge	T	textile	285	well	chlor	*	well	soften	*	well	undet	*	0.002
	U	food	35	wells	none	*	wells	none	*	wells	none	*	0.045
	V	food	168	well	none	*	well	none	*	well	none	*	0.018
Emanuel	W	food	50	well	none	*	well	none	*	well	none	*	0.050
Houston	Y	mining	165	well	iron removal	0.005	creek	none	0.163	creek	none	0.500	0.668
Jasper	AA	mining	34	well	none	0.001	Cedar Cr	none	1.152	--	--	--	1.153
Jones	CC	food	250	wells	none	*	Fishing Cr	complete	*	Fishing Cr	complete	*	0.500
Laurens	DD	textile	576	well	chlor	0.060	Oconee R	complete	1.050	Oconee R	complete	0.040	1.150
	EE	textile	704	well	chlor	0.060	Oconee R	complete	3.100	Oconee R	complete	0.040	3.200
McIntosh	FF	food	120	wells	chlor	*	wells	chlor	*	wells	chlor	*	0.004
	GG	food	35	well	none	*	well	none	*	well & city	chlor	0.005	0.360
Newton	II	textile	325	well	none	*	well	none	*	pond	none	*	0.007
Pulaski	KK	textile	210	city	--	--	well	soften	*	well	soften	*	0.100
Spalding	OO	textile	750	city	--	--	well & city	none	*	--	--	--	0.360
Tattnall	RR	food	10	city	--	--	Ohoopee R	none	*	Ohoopee R	none	*	0.575
Twiggs	AAA	mining	500	wells	undet	*	wells	undet	*	wells	undet	*	undet
	SS	mining	350	wells	none	*	wells	none	*	wells	none	*	1.725
Washington	TT	mining	45	well	none	0.001	well	none	0.024	--	--	--	0.025
	UU	mining	220	wells	none	0.005	wells	none	0.432	--	--	--	0.437
	VV	mining	29	well	none	0.001	well	none	0.050	--	--	--	0.051
Wayne	XX	pulp & paper	715	wells	soften	*	wells	soften	*	wells	undet	*	41.000
Wilkerson	YY	mining	396	wells	none	*	wells	none	*	wells	none	*	5.750
	ZZ	mining	525	city	--	--	L Commissioner Cr	none	*	L Commissioner Cr	none	*	1.250
												Total	78.254

*Breakdown of water use not available. See last column for total water demand.

TABLE W-6
INDUSTRIAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* - 1975 AND 2000
ALTAMAHA BASIN

Location by State and County	Code	Estimated 1975 Requirements		Estimated 2000 Requirements	
		mgd	Costs	mgd	Costs
GEORGIA					
Baldwin	A	0.050	--	0.110	30,000
	B	undet	--	undet	--
	D	1.650	--	1.390	--
Barrow	E	0.480	41,000	0.585	14,000
	F	0.067	27,000	0.165	12,000
Bibb	G	2.500	47,000	3.640	83,000
	I	0.136	--	0.167	--
	J	0.180	--	0.248	5,000
	L	0.100	--	0.153	12,000
	M	23.000	--	33.600	1,607,000
	N	0.095	--	0.123	5,000
	P	0.320	47,000	0.820	12,000
Bleckley	Q	0.140	--	0.170	--
Dodge	T	0.002	--	0.001	--
	U	0.062	--	0.077	--
	V	0.024	--	0.030	--
Emanuel	W	0.068	--	0.085	--
Houston	Y	1.380	10,000	3.360	60,000
Jasper	AA	1.520	--	2.540	33,000
Jones	CC	0.680	--	0.830	--
Laurens	DD	1.110	--	0.950	--
	EE	3.100	--	2.640	--
McIntosh	FF	0.006	--	0.007	--
	GG	0.490	--	0.620	35,000
Newton	II	0.007	--	0.006	--
Pulaski	KK	0.097	--	0.086	--
Spalding	OO	0.350	--	0.295	--
Tattnall	RR	0.800	14,000	0.860	--
Twiggs	AAA	undet	--	undet	--
	SS	2.400	12,000	3.700	60,000
Washington	TT	0.036	--	0.052	--
	UU	0.600	12,000	0.935	47,000
	VV	0.070	--	0.105	18,000
Wayne	XX	61.000	2,500,000	89.000	4,032,000
Wilkerson	YY	8.000	60,000	12.400	168,000
	ZZ	1.730	--	2.680	58,000
Totals		112.250	2,770,000	162.430	6,291,000

*Based on January 1960 constant dollars.

(3/15/62)

SUMMARY

1960

The total average water demand of existing (1960) municipal, domestic, and industrial water systems whose source is within the Altamaha Basin is estimated to be 153.28 mgd. There are 103 municipal water systems (serving 391,430 persons), approximately 78,370 domestic water systems (serving 352,680 persons), and 36 industrially-owned water systems. The total annual cost of obtaining water for the municipal, domestic, and industrial systems is estimated to be $12,901,500.

1975

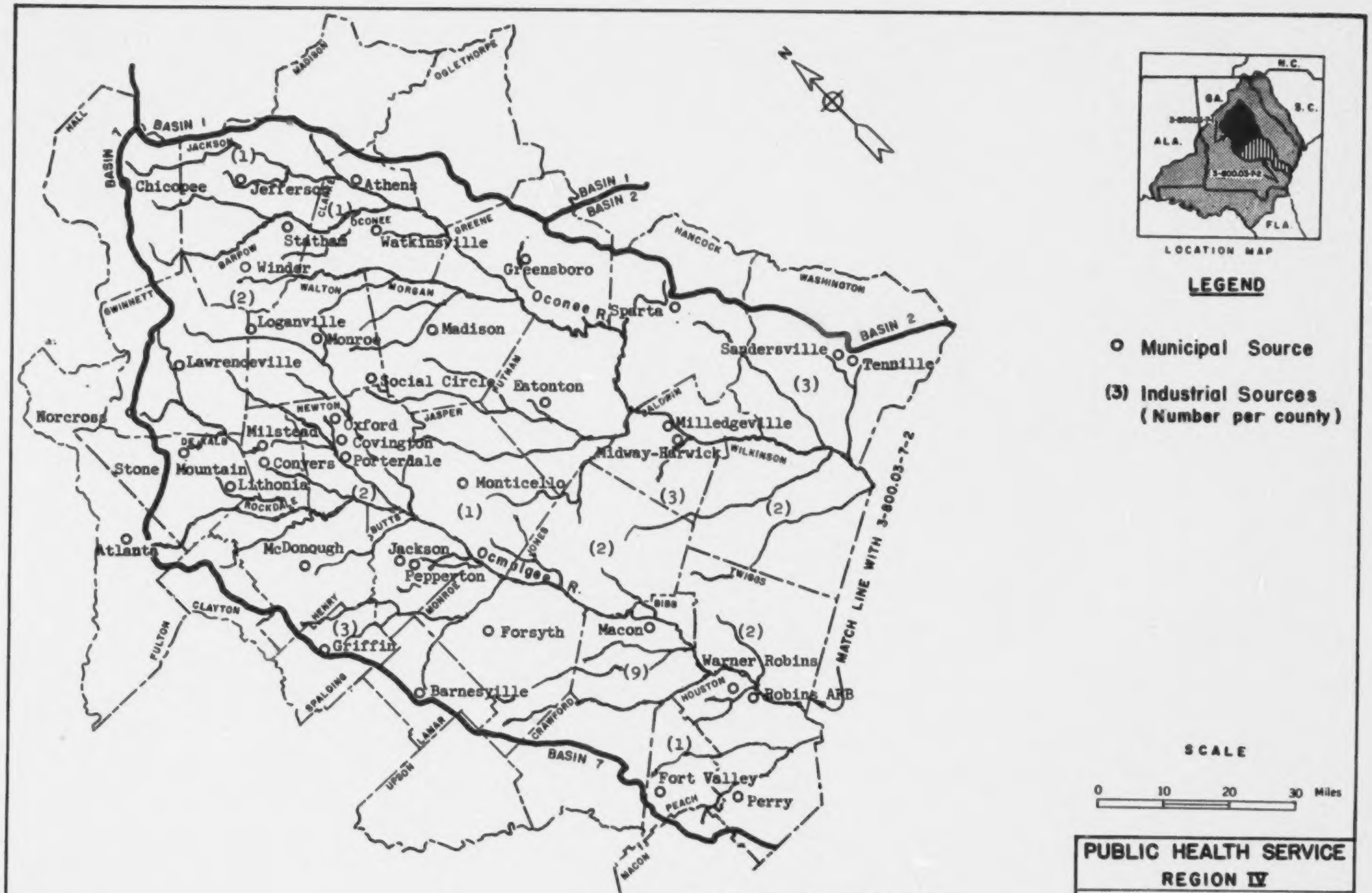
By 1975, the total average water demand of municipal, domestic, and industrial water systems whose source of water is within the Basin is estimated to be 222.06 mgd. The municipal water systems will serve 488,785 persons and there will be 85,200 domestic water systems serving 383,400 persons. The total annual cost of obtaining water for municipal, domestic, and industrial systems is estimated to be $19,432,400 by 1975.

2000

By the year 2000, the total average water demand of municipal, domestic, and industrial water systems whose source of water is within the Basin is estimated to be 325.28 mgd. The municipal water systemswill serve 720,570 persons and there will be an estimated 38,100 domestic water systems serving 171,600 persons. The total annual cost of providing water for municipal, domestic, and industrial water uses is estimated to be $20,416,800.

Water supply sources in the Altamaha Basin are expected to be adequate to meet demands by the year 2000 if they are properly developed. Abatement of existing and possible future water pollution problems will be needed to protect water consumers.

POLLUTION ABATEMENT


N
BASIN 1
BASIN 2
BASIN 7
HALL
JACKSON
MADISON
OGLETHORPE
CLARKE
OCONEE
GREENE
BARROW
WALTON
MORGAN
GWINNETT
NEWTON
JASPER
PUTNAM
DEKALB
ROCKDALE
BUTTS
JONES
BALDWIN
WILKINSON
HANCOCK
WASHINGTON
TWIGGS
BIBB
HOUSTON
CRAWFORD
MONROE
HENRY
CLAYTON
FULTON
SPALDING
LAMAR
UPSON
PEACH
MACON
Chicopee
Jefferson
Athens
Statham
Watkinsville
Winder
Greensboro
Oconee R.
Sparta
Loganville
Monroe
Madison
Lawrenceville
Sandersville
Tennille
Social Circle
Eatonton
Norcross
Milstead
Oxford
Covington
Porterdale
Milledgeville
Midway-Hardwick
Stone Mountain
Conyers
Lithonia
Monticello
Atlanta
McDonough
Jackson
Pepperton
Ocmulgee R.
Forsyth
Macon
Griffin
Barnesville
Warner Robins
Robins AFB
Fort Valley
Perry
(1)
(1)
(2)
(2)
(1)
(3)
(3)
(2)
(2)
(3)
(9)
(2)
(1)
MATCH LINE WITH 3-800.03-7-2
N.C.
GA.
S.C.
ALA.
FLA.
3-800.03-7-1
3-800.03-7-2
LOCATION MAP
LEGEND
o Municipal Source
(3) Industrial Sources (Number per county)
SCALE
0
10
20
30
Miles

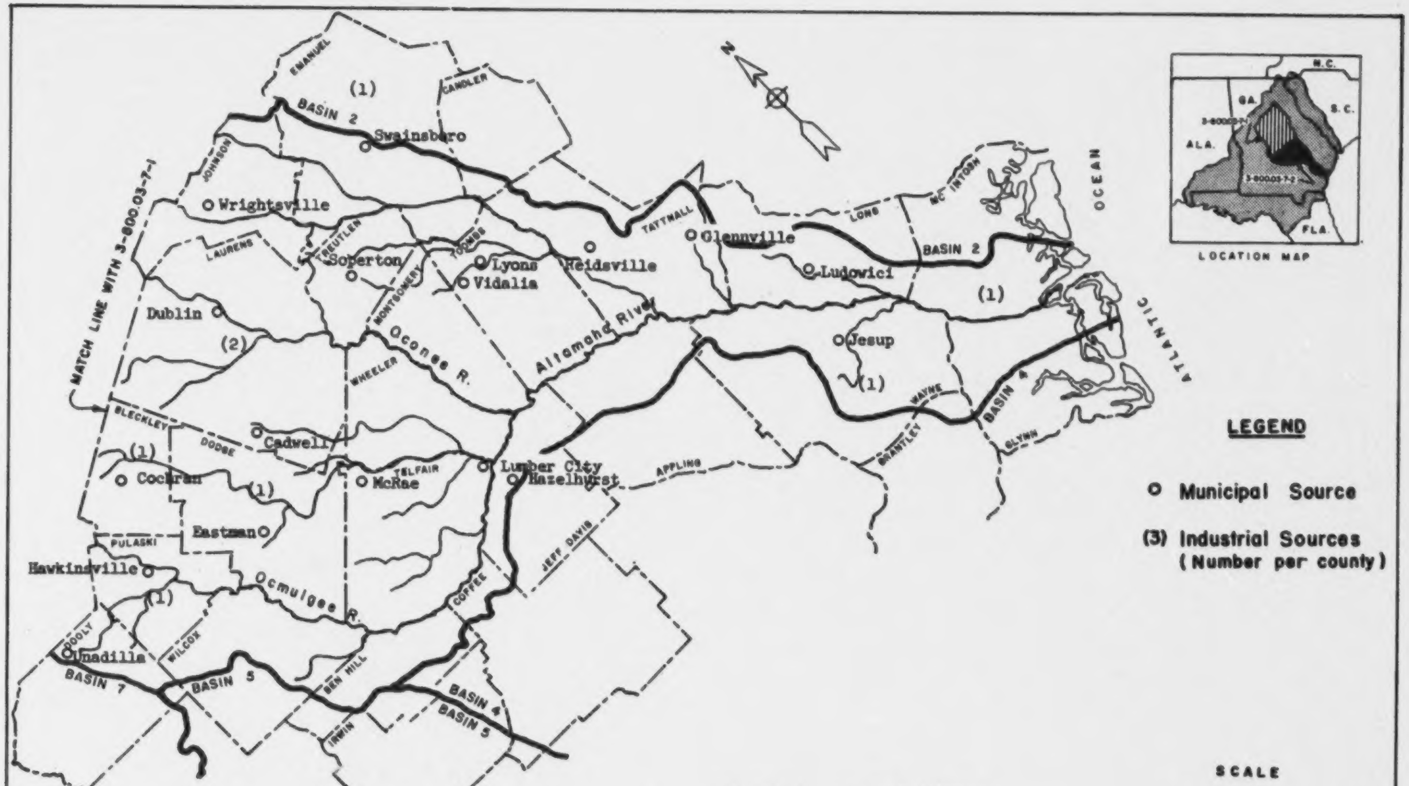
SOURCES OF POLLUTION

FIGURE P-1

PUBLIC HEALTH SERVICE
REGION IV

ALTAMAHA
BASIN NO. 3

JANUARY 1, 1960


MATCH LINE WITH 3-600.03-7-1
N
EMANUEL
(1)
CANDLER
BASIN 2
Swainsboro
JOHNSON
Wrightsville
LAURENS
TREUTLEN
Soperton
MONTGOMERY
TOOMBS
Lyons
Vidalia
Reidsville
TATTNALL
Glennville
LONG
MC INTOSH
Ludovici
BASIN 2
(1)
OCEAN
ATLANTIC
Dublin
(2)
Oconee R.
WHEELER
Altamaha River
Jesup
(1)
WAYNE
BRANTLEY
BASIN 4
GLYNN
BLECKLEY
DODGE
(1)
Cochran
(1)
Cadwell
TELFAIR
McRae
Lumber City
Hazelhurst
APPLING
Eastman
PULASKI
Hawkinsville
(1)
Ocmulgee R.
JEFF DAVIS
COFFEE
DOOLY
Unadilla
WILCOX
BASIN 7
BASIN 5
BEN HILL
IRWIN
BASIN 4
BASIN 5
N.C.
GA.
S.C.
ALA.
3-600.03-7-1
3-600.03-7-2
FLA.
LOCATION MAP
LEGEND
○ Municipal Source
(3) Industrial Sources (Number per county)
SCALE
0
10
20
30 Miles

SOURCES OF POLLUTION

FIGURE P-1

PUBLIC HEALTH SERVICE
REGION IV

ALTAMAHA
BASIN NO. 3

JANUARY 1, 1960

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal and industrial sewage works which discharge to the Altamaha Basin.

Existing and recommended municipal waste facilities have been listed as serving individual municipalities and other political entities. However, in the Atlanta metropolitan area which consists of Clayton, Cobb, DeKalb, Fulton, and Gwinnett Counties, 1975 and 2000 needs were based on countywide projections and are listed in this manner. The existing facilities were, however, considered in the determination of future needs.

Data on specific industrial waste discharges in Fulton County were not available. However, local officials have indicated that the organic waste load contributed by these industries is minor as compared to the organic load contributed by the municipalities within the county.

Projected future pollution abatement requirements for industries and municipalities by the year 1975 and 2000 are presented, as are suggested solutions to present and anticipated future inadequacies. In connection with these solutions, an appraisal of the benefits to be derived from the proposed program and the annual costs of pollution abatement are included.

PROCEDURES AND INVESTIGATIONS

Existing data on pollution abatement in the Basin were obtained from reports, records, and correspondence of the Georgia Department of Public Health, the Georgia State Chamber of Commerce, the Georgia Department of Commerce, and other State and Federal agencies. Extensive field investigations were conducted by the Georgia Department of Public Health, during March, April, and May 1961, and data were submitted to the Public Health Service for inclusion in this memorandum. These field investigations included visits to municipalities, small communities, industries, and institutions.

Data were obtained regarding 68 municipal (which includes nine institutions) and 42 industrially owned sewage and waste works in the Basin(Figure P-1). Industries connected to municipal sewer systems were not inventoried. The data were carefully studied to establish both the present and future pollution abatement requirements.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for communities not listed in the census reports. Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960, modified by considerations of changing economic conditions. However, the population projections of urban areas (municipalities of 2500 or more) were adjusted to match projections made by the U. S. Study Commission.

Existing industries are expected to increase or decrease their waste discharges in the future in proportion to the projected industrial growth or decline. For the purpose of this memorandum, it is assumed that municipalities of 800 or more persons should be sewered now and municipalities of less than 800 should be sewered whenever the present methods of disposal are considered inadequate. It is also assumed that each municipality, regardless of population, now partially sewered should extend its collection system to serve the total population.

In the administration of "Grants for Construction" under Section 6 of Public Law 660 and its amendments, the Public Health Service has established "The substantial removal of settleable solids" as the minimum acceptable treatment for projects in which the Federal Government participates. In general, the Public Health Service considers primary treatment to be the minimum acceptable degree of treatment for municipal sewage and an equivalent treatment the minimum for industrial liquid wastes. The need for additional treatment has been determined on the basis of expected dilution water available during periods of low stream flow and/or downstream water use. Stabilization ponds have been recommended for most municipalities with less than 1500 persons.

It is assumed that primary treatment plants will effect 35 percent BOD removal and secondary plants will effect 85 percent BOD removal. Tertiary treatment or a greater than 85 percent BOD removal has not been considered for purposes of reducing low flow requirements. At these higher treatment efficiencies, dilution water requirements for water quality control depend on dilution of nutrients and chemicals present in the water rather than dilution of remaining BOD. Plant nutrients and chemicals are reduced very little, if any, in conventional sewage treatment plants and must, therefore, be considered as important pollutants in sewage effluents.

Sewage works costs have been estimated on the basis of per capita cost data developed by the Public Health Service and adjusted to the January 1, 1960 Engineering News Record Construction Cost Index for Atlanta, Georgia. Engineering, legal, and financing costs have been added on the basis of United States experience for the period July 1956 - June 1959. Sewage system costs include the cost of structures, devices, equipment, and appurtenances intended for the collection and pumping of sewage. Treatment plant costs include the cost of treatment facilities and outfall lines.

Annual equivalent capital costs, annual operation and maintenance costs, and replacement costs of existing and needed pollution abatement facilities were estimated on the basis of January 1, 1960 constant dollars. An interest rate of 4 1/4 percent was used for determining annual costs for both industries and municipalities.

GENERAL

Water pollution may be defined as the adding to water of any substance, or the changing of water's characteristics in any way which interferes with its use for legitimate purposes. Water polluting substances may be classified according to eight general categories: (1) sewage and other oxygen demanding wastes, (2) infectious agents, (3) plant nutrients, (4) organic chemical exotics, (5) sediments, (6) radioactive substances, (7) heat, and (8) toxic and other mineral and chemical substances.

The Nation and its communities, as well as business, private operations, and individuals, incur losses or damages because of water pollution. Some of these losses or damages are reflected directly in additional costs for construction, operation and maintenace of water treatment facilities. By far the larger share of the total damages is not directly accountable. The impairment to health, the loss or dimunition of fishing and recreational uses, and depreciated property values, caused by polluted waters, have an adverse economic impact which is diffused throughout society. This is paid for through the reduction in utility of the water resources and the restriction on economic growth rather than through dollar payments for corrective devices. Unfortunately, these indirect consequences of pollution are not readily expressed in dollar terms because of their diffusiveness and because they are not recorded by direct, open-market transactions. Nevertheless, such adverse consequences are real and constitute a handicap to the fulfillment of economic and social goals.

Pollution control measures alleviate these adverse conditions and produce economic benefits associated with the improved waters. These benefits are often not apparent to the public, however, because they constitute insurance for future usefulness as well as for immediate purposes, or they may be indirect or intangible. The computation of these benefits faces the same difficulties as the computation of the total damages. That is, the dollar measurement problem has not yet been solved and a yardstick for actions or events not recorded in market transactions is lacking. Many of the benefits from pollution control are in this nonmarket realm, e.g., enhancement of fishing and recreational opportunity, protection of health, scenic improvement, and assurance of the future utility of water resources for various other purposes. The private market price system, therefore, cannot be relied upon solely or chiefly to provide the measurement. New devices for taking into account the social or public values must be devised.

INVENTORY OF POLLUTION ABATEMENT

SOURCES OF POLLUTION

The surface waters of the Basin are used for the final disposal of liquid wastes, treated and untreated, from 68 municipalities (including 9 institutions) and 42 industries as shown by Tables P-1 and P-2. Municipalities discharge 66.3 mgd of sewage of which 55.0 mgd has undergone treatment of some type and industries discharge 73.4 mgd of which 67.0 mgd has undergone treatment of some type.

A total of 537,480 persons are served by the 68 municipalities which discharge to the Altamaha Basin. The total population equivalent (PE) of the municipal sewage discharged to the Altamaha Basin is estimated to be 784,900 before treatment and 437,830 after treatment.

The industrial wastes produced in the Basin include textile, food, mining, metal, chemical, and pulp and paper wastes. The textile industry, which is the most numerous industry in the Basin, accounts for 13 of the 42 industries surveyed. However, the 2 pulp and paper mills in the Basin produce 60 percent of the total PE. The strength of the organic wastes from the 19 industries for which data were available is estimated to be 624,295 PE based on BOD. The PE of 10 industries was undetermined. In addition, there are 14 industries which produce inorganic liquid wastes such as acids, alkalies, sediments, etc. The total population equivalent of the industrial wastes after treatment is estimated to be 420,165.

The waters of the Basin also receive pollution from natural sources and from the agricultural use of the land. Pollution from natural sources includes organic material leached from the decaying matter in the forests and swamps and minerals dissolved from the soil and rocks. The pollution resulting from the agricultural use of the land includes organic and mineral fertilizers, insecticides, pesticides, and herbicides which are washed into the waters during heavy rains or which are inadvertently deposited into the waters during application. Silt eroded from roadsides and from land, especially in the Piedmont Province, is a pollutant in the upper portion of the Basin. Drainage from livestock feed lots, dairy barns, pig pens, manure heaps, and other farm refuse also adds to the pollution load carried by the streams.

TABLE P-1
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity PE 1,000s	Design Capacity Flow mgd	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Receiving Stream
GEORGIA									
Athens #1	31,355	24,000	3.500	secondary	50.00	5.00	61,480	10,000	North Oconee R
#2	--	12,400	1.240	none	--	--	12,400	12,400	Middle Oconee R
Atlanta (part)									
South River Pt	--	84,800[1]	10.000	secondary	210.00	17.50	168,000	58,000	South River
Intrenchment Cr Pt	--	120,290[2]	13.200	secondary	140.00	14.00	153,000	59,000	Intrenchment Cr-South R
Atlanta General Depot	--	3,000	0.285	secondary	12.00	1.20	1,650	150	creek-South R
Barnesville	4,919	3,950	8.000	primary	10.00	1.00	4,500	3,400	Tobosofkee Cr-Ocmulgee R
Cadwell	360	300	0.030	none	--	--	300	300	Batson Cr-Ocmulgee R
Chicopee (uninc)	--	1,500	0.150	primary	undet	undet	1,500	1,000	Walnut Cr-Oconee R
Clayton County									
Pinecrest Forest S/D	--	80	0.008	secondary	0.10	0.01	80	10	N Panther Cr-South R
Cochran	4,714	2,300	0.012	primary	undet	undet	2,300	2,000	Jordan Cr-Swamp-Ocmulgee R
Conyers	2,881	1,850	0.270	none	--	--	2,000	2,000	br-Yellow R
Covington	8,167	6,000	0.700	secondary	10.00	1.00	6,000	600	Dried Indian Cr-Yellow R
DeKalb County									
Shoal Cr Pt	--	28,300	4.000	secondary	30.00	3.00	30,000	15,000	Shoal Cr-South R
Snapfinger Pt	--	undet[3]	--	secondary	20.00	2.00	--	--	South R
Dublin	13,814	7,900	0.790	none	--	--	10,000	10,000	Oconee R
V.A. Hospital	--	1,070	0.145	secondary	1.50	0.15	2,000	700	Hunger & Hardship Cr-Oconee R
Eastman #1	5,118	2,000	0.200	secondary	undet	undet	2,000	1,000	Sugar Cr-Little Ocmulgee R
#2	--	1,000	0.100	secondary	undet	undet	1,000	500	Gum Swamp Cr-L Ocmulgee R
Eatonton #1	3,612	1,450	0.090	primary	2.00	0.20	1,450	1,050	L. River-Lake Sinclair
#2	--	1,450	0.090	none	--	--	1,450	1,450	Rooty Cr-Lake Sinclair
Rock Eagle Park	--	400	0.020	septic tk	undet	undet	400	350	L Grady Cr-Little R
Forsyth	3,697	3,300	0.400	none	--	--	3,500	3,500	Tobosofkee Cr-Ocmulgee R
Fort Valley	8,310	6,000	0.500	secondary	10.00	1.00	6,000	600	Bay Cr-Big Indian Cr-Ocmulgee R
Glennville	2,791	2,660	0.350	secondary	4.00	0.40	2,660	1,300	br-Beard's Cr-Altamaha R
Greensboro	2,773	2,270	0.135	none	--	--	2,270	2,270	Richland Cr-Oconee R
Griffin (part)	--	8,000	0.800	secondary	20.00	1.50	18,000	2,000	Cabin Cr-Ocmulgee R
Hawkinsville	3,967	3,380	0.340	none	--	--	4,480	4,480	Ocmulgee R

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TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
GEORGIA - Cont'd									
Hazelhurst	3,699	3,200	0.450	primary	3.00	0.30	3,200	2,100	br-Ocmulgee R
Jackson	2,545	2,500	0.150	secondary	2.00	0.20	2,500	750	Yellow Water Cr-Ocmulgee R
Jefferson	1,746	1,100	0.100	none	--	--	1,100	1,100	Currey Cr-North Oconee R
Jesup	7,304	7,000	0.600	primary	6.00	0.60	7,000	4,500	McMullen Cr-Altamaha R
Lawrenceville	3,804	3,600	0.450	secondary	6.30	0.63	3,600	750	Redland Cr-Yellow R
Lithonia #1	1,667	1,000	0.070	none	--	--	1,000	1,000	br-Yellow R
#2	--	1,000	0.070	none	--	--	1,000	1,000	Haney Cr-South R
Loganville	926	700	0.035	primary	undet	undet	700	550	Big Flat Cr- Alcovy R
Ludowici	1,578	1,200	0.085	none	--	--	1,200	1,200	Fountain Branch-Altamaha R
Lumber City	1,360	800	0.065	none	--	--	800	800	Ocmulgee R
Lyons	3,219	2,400	0.140	septic tks	undet	undet	2,400	2,400	Swift Cr-Pendleton Cr-Ohoopee R
McDonough	2,224	1,800	0.150	none	--	--	1,800	1,800	br-Walnut Cr-South R
McRae #1	2,738	2,200	0.160	primary	1.80	0.18	2,500	1,500	Sugar Cr-Little Ocmulgee R
#2	--	450	0.030	none	--	--	450	450	Gum Swamp Cr-Little Ocmulgee R
Macon #1	69,764	60,000	5.000	primary	120.00	12.00	80,000	60,000	Ocmulgee R
#2	--	20,000	2.000	none	--	--	40,000	40,000	Ocmulgee R
Cochran Field	--	350	0.030	secondary	undet	undet	375	30	Echeconnee Cr-Ocmulgee R
Madison #1	2,680	1,500	0.085	primary	2.10	0.21	1,500	900	br-Hard Labor Cr-Apalachee R
#2	--	300	0.015	primary	0.35	0.04	300	200	br-Sugar Cr-Oconee R
Midway-Harwick	16,909	1,800	0.100	none	--	--	1,800	1,800	Oconee R
Milledgeville	11,117	8,000	0.800	none	--	--	31,000	31,000	Oconee R
State Hospital	--	12,650	2.000	none	--	--	13,240	13,240	Oconee R
Colony Farm	--	350	0.300	septic tks	undet	undet	350	350	Reedy Cr-Oconee R
Milstead	1,047	250	0.013	none	--	--	250	250	Yellow R
Monroe #1	6,826	1,200	0.110	secondary	1.50	0.15	1,200	100	br-Jack's Cr-Apalachee R
#2	--	2,850	0.950	none	--	--	23,840	23,840	Mountain Cr-Alcovy R
#3	--	2,450	0.240	none	--	--	2,450	2,450	Jacks Cr-Apalachee R
Monticello #1	1,931	750	0.070	secondary	1.25	0.13	750	750	Persons Cr-Murder Cr-Oconee R
#2	--	750	0.070	secondary	1.25	0.13	750	750	Whiteoak Cr-Murder Cr-Oconee R

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TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
GEORGIA - Cont'd									
Norcross	1,605	315	0.015	septic tk	undet	undet	315	275	br-Beaver Ruin Cr-Yellow R
Metro Mobile-Homes Park	--	250	0.020	secondary	0.40	0.04	250	0	Beaver Ruin Cr-Yellow R
Oxford Emory-at-Oxford Col	--	315	0.034	primary	undet	undet	315	250	br-Yellow R
Pepperton	523	690	0.075	primary	0.50	0.05	750	500	br-Yellow Water Cr-Ocmulgee R
Perry	6,032	4,000	0.400	none	--	--	7,300	7,300	Indian Cr-Ocmulgee R
Porterdale	2,365	2,365	0.300	none	--	--	2,400	2,400	Yellow R
Reidsville	1,229	825	0.045	septic tk	undet	undet	825	750	Brazells Cr-Ohoopee R
Reidsville Prison	--	3,400	0.600	primary	1.50	0.15	3,750	3,000	Ohoopee R
Robins AFB #1	--	10,000	0.823	primary	30.00	2.16	undet	undet	ditch-Horse Cr-Ocmulgee R
#2	--	--	0.297	secondary	8.25	0.83	undet	undet	ditch-Ocmulgee R
Sandersville	5,425	3,200	0.400	none	--	--	3,200	3,200	Limestone Cr-Oconee R
Social Circle #1	1,780	400	0.020	none	--	--	400	400	br-Alcovy R
#2	--	400	0.020	none	--	--	400	400	br-Little R
#3	--	260	0.012	none	--	--	260	260	br-Little R
Soperton	2,317	250	0.010	septic tk	undet	undet	250	225	Tiger Cr-Oconee R
Sparta	1,921	700	0.040	secondary	undet	undet	700	400	Buffalo Cr-Oconee R
Statham	711	360	0.030	primary	0.50	0.05	360	250	Barber Cr-Oconee R
Stone Mountain	1,976	150	0.010	primary	0.50	0.03	150	150	Mountain Cr-Yellow R
Swainsboro	5,943	4,000	0.400	primary	2.50	0.25	4,000	3,200	br-Yamgrandee Cr-Ohoopee R
Tennille	1,837	850	0.060	primary	undet	undet	850	700	Ohoopee R
Unadilla	1,304	700	0.070	septic tk	undet	undet	700	700	Lamp Cr-Ocmulgee R
Vidalia #1	7,569	1,875	0.370	primary	2.80	0.28	1,875	1,250	Rocky Cr-Ohoopee R
#2	--	3,775	0.750	primary	4.00	0.40	3,775	2,500	Swift Cr-Pendleton Cr-Ohoopee R
Warner Robins	18,633	21,500	1.300	secondary	undet	1.65	21,500	7,000	Echeconnee Cr-Ocmulgee R
Watkinsville	758	100	0.010	none	--	--	100	100	Town Cr-Oconee R
Winder #1	5,555	1,300	0.130	none	--	--	1,300	1,300	Marburg Cr-Apalachee R

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TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity PE 1,000s	Design Capacity Flow mgd	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Receiving Stream
GEORGIA - Cont'd									
Norcross	1,605	315	0.015	septic tk	undet	undet	315	275	br-Beaver Ruin Cr-Yellow R
Metro Mobile-Homes Park	--	250	0.020	secondary	0.40	0.04	250	0	Beaver Ruin Cr-Yellow R
Oxford									
Emory-at-Oxford Col	--	315	0.034	primary	undet	undet	315	250	br-Yellow R
Pepperton	523	690	0.075	primary	0.50	0.05	750	500	br-Yellow Water Cr-Ocmulgee R
Perry	6,032	4,000	0.400	none	--	--	7,300	7,300	Indian Cr-Ocmulgee R
Porterdale	2,365	2,365	0.300	none	--	--	2,400	2,400	Yellow R
Reidsville	1,229	825	0.045	septic tk	undet	undet	825	750	Brazells Cr-Ohoopee R
Reidsville Prison	--	3,400	0.600	primary	1.50	0.15	3,750	3,000	Ohoopee R
Robins AFB #1	--	10,000	0.823	primary	30.00	2.16	undet	undet	ditch-Horse Cr-Ocmulgee R
#2	--	--	0.297	secondary	8.25	0.83	undet	undet	ditch-Ocmulgee R
Sandersville	5,425	3,200	0.400	none	--	--	3,200	3,200	Limestone Cr-Oconee R
Social Circle #1	1,780	400	0.020	none	--	--	400	400	br-Alcovy R
#2	--	400	0.020	none	--	--	400	400	br-Little R
#3	--	260	0.012	none	--	--	260	260	br-Little R
Soperton	2,317	250	0.010	septic tk	undet	undet	250	225	Tiger Cr-Oconee R
Sparta	1,921	700	0.040	secondary	undet	undet	700	400	Buffalo Cr-Oconee R
Statham	711	360	0.030	primary	0.50	0.05	360	250	Barber Cr-Oconee R
Stone Mountain	1,976	150	0.010	primary	0.50	0.03	150	150	Mountain Cr-Yellow R
Swainsboro	5,943	4,000	0.400	primary	2.50	0.25	4,000	3,200	br-Yamgrandee Cr-Ohoopee R
Tennille	1,837	850	0.060	primary	undet	undet	850	700	Ohoopee R
Unadilla	1,304	700	0.070	septic tk	undet	undet	700	700	Lamp Cr-Ocmulgee R
Vidalia #1	7,569	1,875	0.370	primary	2.80	0.28	1,875	1,250	Rocky Cr-Ohoopee R
#2	--	3,775	0.750	primary	4.00	0.40	3,775	2,500	Swift Cr-Pendleton Cr-Ohoopee R
Warner Robins	18,633	21,500	1.300	secondary	undet	1.65	21,500	7,000	Echeconnee Cr-Ocmulgee R
Watkinsville	758	100	0.010	none	--	--	100	100	Town Cr-Oconee R
Winder #1	5,555	1,300	0.130	none	--	--	1,300	1,300	Marburg Cr-Apalachee R

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TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
ALTAMAHA BASIN

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
GEORGIA - Cont'd									
Winder #2	--	700	0.070	none	--	--	700	700	Cedar Cr-Mulberry R
#3	--	2,000	0.200	primary	undet	undet	2,000	1,000	Beech Cr-Mulberry R
Wrightsville	2,056	1,000	0.100	septic tk	undet	undet	1,000	1,000	Cedar Cr-Ohoopee R
Totals		537,480	66.304				784,900	437,830	

[1] Serves portions of Atlanta, East Point, Hapeville, and Clayton County.
[2] Serves portions of Atlanta and DeKalb County.
[3] Under construction at time of survey.

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TABLE P-2
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
ALTAMAHA BASIN

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
GEORGIA									
Baldwin	B	75	textile	process	0.008	none	50	50	branch-Oconee R
	C	25	food	meat pk	0.010	none	1,250	1,250	branch-Oconee R
	D	1,142	textile	wool dying & sanitary proc	1.550	primary	undet	undet	sewer to Oconee R
Barrow	E	150	food	poultry proc	0.300	stab pond	11,000	3,000	Marburg Cr-Apalachee R
	F	60	metal	anodizing & plating	0.030	pH adjust	--	--	trib-Barbour Cr-Apalachee R
Bibb	G	1,000	fiber board	wood fiber & alkalies	1.200	settling	undet	undet	Rocky Cr-Tobeskofee Cr Ocmulgee R
	H	705	textile	dye & bleach	0.600	lagoon	undet	undet	Ocmulgee R
	I	36	food	rendering	0.122	none	4,900	4,900	Ocmulgee R
	J	31	chemical	acids	0.160	none	--	--	Ocmulgee R
	L	80	mining	clay tailings & acids	0.072	settling	--	--	Ocmulgee R
	M	550	pulp & paper	kraft proc	15.300	aeration& settling lagoon	134,000	94,000	Ocmulgee R
	N	60	chemical	acids	0.070	pH adjust	--	--	Walnut Cr
	O	63	lumber	creosote oil	0.028	settling	--	--	ditch-Tobeskofee Cr-Ocmulgee R
	P	750	metal fab	plating	0.200	none	--	--	Ocmulgee R
				sanitary	0.005	secondary	85	20	Ocmulgee R
Bleckley	Q	10	food	meat pk	0.100	septic tk	1,830	1,460	pond
Clarke	R	undet	food	dairy	0.033	none	undet	undet	North Oconee R
Dodge	S	12	food	meat pk	0.015	none	1,200	1,200	Gum Swamp Cr-L.Ocmulgee R
	U	35	food	cannery	0.042	screens	8,400	8,400	Sugar Cr-L. Ocmulgee R
	V	168	food	organic	0.003	grease removal	undet	undet	L. Ocmulgee R
Emanuel	W	50	food	poultry proc	0.050	pond	1,445	150	Ohoopee R

(3/15/62)

TABLE P-2 (CONT'D)
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
ALTAMAHA BASIN

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
GEORGIA - Cont'd									
Jackson	Z	425	textile	dye & finish	0.300	stab pond	undet	undet	N. Oconee R
Jasper	AA	34	mining	feldspar	1.150	settling lagoon	--	--	trib-Falling Cr-Ocmulgee R
Jones	BB	150	textile	process & sanitary	0.024	none	undet	undet	Ocmulgee R
	CC	250	food	canning	0.750	screens	80,000	50,000	Fishing Cr-Oconee R
Laurens	DD	576	textile	wool dying	1.000	none	8,200	8,200	ditch-swamp-Oconee R
	EE	704	textile	wool dying	3.100	none	48,180	48,180	ditch-Oconee R
McIntosh	GG	35	food	sea food	0.360	none	undet	undet	Altamaha R
Newton	HH	2,201	textile	dye	0.005	none	undet	undet	Yellow R
	II	325	textile	process	0.001	none	undet	undet	Dried Indian Cr-Yellow R
Peach	JJ	400	food	canning	0.350	none	23,760	23,760	ditch-Bay Cr-Ocmulgee R
Pulaski	KK	210	textile	starch & bleach	0.075	none	195	195	Ocmulgee R
Spalding	MM	950	textile	batch dye	0.060	none	250	250	branch-Cabin Cr-Ocmulgee R
	NN	550	textile	sanitary & process	0.010	none	150	150	branch-Cabin Cr-Ocmulgee R
	OO	750	textile	bleach & dye	2.000	settling	79,200	50,000	pond-Cabin Cr-Ocmulgee R
Twiggs	AAA	500	mining	kaolin proc	undet	none	--	--	Stone Cr-Ocmulgee R
	SS	350	mining	inorganics & acids	0.860	settling lagoons	--	--	Ocmulgee R
Washington	TT	45	mining	clay tailings	0.012	settling lagoons	--	--	Limestone Cr-Ocmulgee R
	UU	220	mining	clay tailings & acids	0.216	settling lagoons	--	--	Limestone Cr-Ocmulgee R
	VV	29	mining	clay tailings	0.025	settling lagoons	--	--	Limestone Cr-Ocmulgee R

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TABLE P-2 (CONT'D)
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
ALTAMAHA BASIN

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD)		Discharged To
							Untr'd Waste	Disch'd Waste	
GEORGIA - Cont'd									
Wayne	XX	715	pulp & paper	kraft proc.	40.000	aeration & settling lagoons	250,200	125,000	Altamaha R
Wilkerson	YY	396	mining	clay tailings	2.160	settling lagoons	--	--	Commissioner Cr-Bluff Cr-Oconee R
	ZZ	525	mining	inorganic tailings & acids	1.000	settling lagoons	--	--	L. Commissioner Cr-Oconee R
Totals					73.356		624,295	420,165	

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EXISTING SEWAGE TREATMENT FACILITIES

As shown by Table P-1, 19 municipalities and institutions provide secondary treatment for sewage collected from 318,800 persons (or 59 percent of the total sewered population discharging sewage to the Basin's waters). Stabilization ponds have been considered as secondary treatment plants for the purpose of this summary. The treatment plants at Monticello were reported to be inoperative at the time of the field survey.

There are 20 municipalities and institutions in the Basin which provide primary treatment for the sewage collected from 111,515 persons (or 21 percent of the total sewered population discharging sewage to the Basin's waters). The primary treatment plants at Cochran, Loganville, Reidsville Prison, Stone Mountain, Swainsboro, and Tennille are overloaded and/or improperly maintained and consequently provide little treatment (less than 20 percent BOD removal).

Septic tanks are provided by 8 municipalities and institutions serving 6,240 persons (or about one percent of the total sewered population discharging sewage to the Basin's waters). The septic tanks at Lyons, Colony Farm, Soperton, Reidsville, Unadilla, and Wrightsville are overloaded and consequently ineffective as treatment facilities.

The remaining 21 municipalities and institutions which discharge sewage to the Basin's waters provide no treatment. Approximately 59,330 persons are served by the collection systems in these municipalities. In addition, Athens, Eatonton, McRae, Macon, Monroe, and Winder provide treatment for only a portion of their sewered population. The remaining sewered portion (41,600) is discharged untreated. Thus, sewage collected from a total of 100,930 persons (or 19 percent of the total sewered population discharging sewage to the Basin's waters) is discharged untreated to surface waters.

The sewage treatment plants listed for the City of Atlanta also serve portions of East Point, Hapeville, DeKalb County, and Clayton County.

As shown by Table P-2, 23 of the 42 industries listed provide treatment of some degree to their liquid wastes. The remaining 19 industries provide no treatment for their liquid wastes.

One industry provides the equivalent of primary treatment and three industries have stabilization ponds. There are 12 industries which provide sedimentation of their liquid wastes, and 2 others aerate the wastes before sedimentation. Two industries adjust the pH of their wastes before discharge. The remaining 22 industries provide either septic tanks, screens, grease removal or no treatment at all of their wastes.

As stated previously, data regarding specific industrial waste discharges in Fulton County are not available; and, therefore, have not been included in Table P-2. All other industries in the Basin, however, discharge liquid wastes either to septic tanks with subsurface drain fields or to municipal sewer systems. Industries disposing of liquid wastes by these methods were not inventoried and no data are available.

Soil conservation practices used in many areas of the Basin are very useful in preventing pollution resulting from agricultural use of the land. Good erosion preventative measures, practiced by the highway and railroad maintenance departments, assist in the control of sediment coming from roadway embankments. There are no pollution control measures used especially for the purpose of abating pollution from natural sources.

EFFECTS ON STREAMS

Limited data are available on the effects of municipal and industrial waste discharges on the quality of the surface waters of the Altamaha Basin. The data that are available are limited mostly to the chemical quality of the surface waters. Much of these data have been summarized and are presented in the report, Water Quality Basic Data - Southeast River Basins, 1961, prepared for the U. S. Study Commission by the Public Health Service.

The chemical quality of the surface waters of the Altamaha Basin appears to be good. The total dissolved solids reported, ranged from 20 to 109 ppm. The concentration of individual chemical constituents was low and hardness was consistently reported below 50 ppm. There are, however, several areas in the Basin where municipal and industrial waste discharges have degraded surface water quality.

Waste discharges from the Atlanta metropolitan area have resulted in serious water quality degradation in the headwater areas of the South River. Depressed oxygen levels and high bacterial concentrations have been reported for several miles downstream. Waste discharges from large industrial water users in Macon and Jesup, Georgia, have, in the past, resulted in serious quality degradation in both the Ocmulgee and Altamaha Rivers. Oystering in the tidal estuary of the Altamaha River has been closed for many years due to high bacterial concentrations. The source or sources of this pollution is not known.

During November 1960, January and February 1961, and June

1961, the Public Health Service conducted field studies at nine stations in the Altamaha Basin. Three of these stations were located on the Oconee River at Athens, Milledgeville, and Dublin; one on the South River near McDonough; three on the Ocmulgee River at Jackson, Macon, and Hawkinsville; and two on the Altamaha River near Baxley and at Doctortown.

The average dissolved oxygen at the three stations on the Oconee River was generally above 85 percent of saturation. However, unusually high coliform concentrations were found at the Athens station as were total organic nitrogen concentrations.

Depressed oxygen levels were found at the stations in the Ocmulgee sub-basin. The average dissolved oxygen reported for the South River near McDonough ranged from 49 to 66 percent of saturation. The median concentration of coliforms (8400 to 29,000 MPN per 100 ml), and the average concentrations of total organic nitrogen (0.80 to 1.80 ppm) and of phosphates (0.63 to 1.02 ppm) indicated that the quality of these waters had been degraded probably due to the discharge of municipal wastes into the headwaters of the South River. The average dissolved oxygen reported for the Ocmulgee River at Jackson, which was the next downstream station, ranged from 55 to 79 percent of saturation and the average total organic nitrogen ranged from 0.33 to 0.76 ppm. Median coliform concentrations were low, ranging from 590 to 840 MPN per 100 ml.

The average dissolved oxygen at the two other stations on the Ocmulgee River, at Macon and Hawkinsville, ranged from 71 to 91 percent of saturation and the average organic nitrogen ranged from 0.38 to 0.66 ppm. Median coliform concentrations at both stations were high; at Macon it ranged from 166,500 to 1,415,000 MPN per 100 ml and at Hawkinsville from 3,350 to 68,000 MPN per 100 ml. Municipal waste discharges from Macon probably accounted for these excessively high bacterial concentrations. The average dissolved oxygen reported at the two stations on the Altamaha River exceeded 80 percent of saturation. The concentration of coliforms, nitrogen, and other water quality parameters indicated that the waters of the main stem of the Altamaha at these two stations were of good quality.

Stream surveys conducted by the Georgia Game and Fish Commission have indicated that there are several stream reaches within the Basin which are affected by municipal and industrial waste discharges. In the Ocmulgee subbasin, pollution conditions have been observed in the South River above Jackson Reservoir, and in the Ocmulgee River below Macon, Warner Robins, and Hawkinsville. Periodic fish kills have been reported in the Ocmulgee River below Macon during periods of low water levels and high temperatures. The Game and Fish Commission considers the Ocmulgee River to be one of the finest fishing streams in the State of Georgia.

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In the Oconee River, industrial waste discharges have been noted by the Commission at Athens, Milledgeville, near the Laurens-Wilkinson County line, and at Dublin. However, deleterious effects of these discharges on aquatic life have not been noted.

Pollution of the Altamaha River by the industrial waste discharges of a pulp and paper mill in Jesup has been observed by the Commission. Although the problem of fish kills below the plant has been effectively corrected through installation of treatment devices, the growth of bacteriological slimes has seriously affected the shad industry below Jesup. The extensive growth of this slime on the nets used in the shad fishery, not only makes the nets ineffective at the time of fishing, but also ruins the nets for future use.

POLLUTION ABATEMENT REQUIREMENTS FOR 1960

SEWERAGE

At the present time, 46 municipalities in the Basin serve only a part of their populations and 13 municipalities with populations of 800 or more have no sewage collection system. The 46 municipalities with existing systems should extend their collection systems to serve an additional 52,500 persons and 13 municipalities should construct new collection systems to serve 15,400 persons. The total capital outlay required is estimated to be $3,395,000 as shown by Table P-3.

TREATMENT FACILITIES

The degree of treatment required at each municipality has been determined on the basis of dilution water available during periods of low stream flow and/or downstream water use. Dilution water use requirements are discussed more fully in the LOW FLOW AUGMENTATION section of this memorandum.

Existing treatment facilities at 16 municipalities and institutions are adequate for present needs. These are the Atlanta General Depot, Clayton County, Covington, DeKalb County, Fort Valley, Glennville, Griffin, Jackson, Lawrenceville, Robins AFB, Rock Eagle Park at Eatonton, V. A. Hospital at Dublin, Emory-at-Oxford College, Cochran Field at Macon, Metropolitan Mobile Homes Park at Norcross, and Warner Robins.

There are 40 municipalities which presently do not provide treatment or have only septic tanks and should construct new treatment plants. Of this total, 10 should construct secondary treatment plants, 18 should construct stabilization ponds, and 12 should construct primary treatment plants. There are 23 municipalities which should either make additions or enlargements to their existing

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treatment plants. Of these, 8 should add secondary units to existing primary plants. Cochran, Loganville, Reidsville Prison, Sparta, Stone Mountain, Tennille, and Winder should replace existing obsolete plants with stabilization ponds. The total capital outlay required for needed new construction and additions to existing sewage treatment plants is estimated to be $19,552,000 as shown by Table P-3.

Industrial liquid waste disposal by 7 of the industries surveyed is adequate at present. However, the remaining 35 industries should provide more satisfactory methods of waste treatment and disposal. Ten of these industries could connect to nearby municipal sewer systems. Primary treatment should be provided by 5 of the industries and 9 should provide stabilization ponds. Six industries should provide sedimentation for the wastes and the remaining 5 industries should provide chemical precipitation, ion exchange or other similar types of treatment. The total capital outlay required for industrial pollution abatement facilities in 1960 is estimated to be $1,700,000 as shown by Table P-4.

OTHER NEEDS

As mentioned in the EFFECTS ON STREAMS section, little information is available on surface water quality in the Altamaha Basin. The limited data which are available do, however, indicate some areas within the Basin in which the discharge of municipal and industrial wastes has degraded water quality.

One of the more critical of these areas is the upper portion of the Basin in the South River. The discharge of municipal wastes from the Atlanta metropolitan area has seriously affected the quality of the South River and possibly the Ocmulgee River. A more extensive study will be needed to adequately define the extent of this problem and its solution.

Study is needed in the tidal area of the Basin to determine the sources and extent of the pollution which has inhibited the development of the shellfish industry in that area.

A need also exists in the Altamaha Basin and other areas of the Southeast River Basins for research and studies to determine the effect and control of pollution due to insecticides, pesticides, and herbicides.

FUTURE POLLUTION ABATEMENT REQUIREMENTS

PROJECTIONS

Future pollution abatement needs of the Atlanta metropolitan area have been determined on a countywide basis for each of the four counties, Clayton, DeKalb, Fulton, and Gwinnett, which will

TABLE P-3
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
ALTAMAHA BASIN

	Treatment Facilities		Estimated Costs in $1,000		
Municipality	Des'd for (1,000 PE)	Type Recommended	Sewerage	Treatment	Total
GEORGIA					
Abbeville	0.9	secondary	44	22	66
Almo	1.2	secondary	41	26	67
Athens #1	50.0	secondary	--	--	--
#2	15.0	primary	--	623	623
Atlanta Intrenchment Cr Plant	160.0	secondary	--	500	500
Barnesville	10.0	secondary	48	388	436
Byron	1.2	primary	57	114	171
Cadwell	0.5	secondary	3	16	19
Chicopee	1.5	secondary	--	84	84
Cochran	5.0	secondary	121	70	191
Conyers	3.3	secondary	52	390	442
Covington	10.0	secondary	108	--	108
Darien	2.0	primary	78	164	242
Dublin	15.0	primary	242	623	865
Duluth (part)	0.5	secondary	25	16	41
East Dublin	1.8	primary	84	152	236
Eastman	5.4	secondary	106	305	411
Eatonton	3.8	secondary	36	406	442
Forsyth	4.0	secondary	20	458	478
Fort Valley	10.0	secondary	116	--	116
Glennville	4.0	secondary	7	--	7
Gordon	2.2	secondary	90	286	376
Gray	1.9	secondary	66	36	102
Greensboro	3.2	secondary	25	378	403
Griffin (part)	20.0	secondary	143	--	143
Hawkinsville	5.4	primary	29	340	369
Hazelhurst	3.7	secondary	25	185	210
Helena	1.5	secondary	65	31	96
Jefferson	1.9	secondary	32	35	67
Jeffersonville	1.3	secondary	51	28	79
Jesup	8.0	secondary	15	500	515
Lawrenceville	6.3	secondary	10	--	10
Lithonia	2.0	secondary	--	37	37
Loganville	1.5	secondary	12	30	42
Ludowici	2.0	secondary	19	37	56

TABLE P-3 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
ALTAMAHA BASIN

Municipality	Treatment Facilities Des'd for (1,000 PE)	 Type Recommended	Estimated Costs in $1,000 Sewerage	 Treatment	 Total
GEORGIA - Cont'd					
Lumber City	1.5	primary	28	134	162
Lyons	3.2	secondary	41	384	425
McDonough	2.5	secondary	21	317	338
McRae	2.7	primary	4	97	101
Macon	120.0	secondary	--	2760	2760
Madison	2.7	secondary	44	132	176
Midway-Hardwick	4.3	primary	120	290	410
Milledgeville	35.0	primary	160	1170	1330
State Hospital	15.0	primary	--	623	623
Colony Farm	0.5	secondary	--	15	15
Norcross (part)	1.0	secondary	40	23	63
Milstead	1.0	secondary	40	23	63
Monroe	30.0	secondary	16	222	238
Monticello	2.5	secondary	21	--	21
Mt. Vernon	1.4	primary	58	127	185
Oxford	1.1	secondary	52	25	77
Pepperton	0.8	primary	--	20	20
Perry	10.0	secondary	101	865	966
Porterdale	2.5	primary	--	192	192
Reidsville	1.5	secondary	20	31	51
Reidsville Prison	4.0	secondary	--	62	62
Sandersville	5.6	secondary	111	579	690
Social Circle	1.9	secondary	36	36	72
Soperton	2.6	secondary	103	318	421
Sparta	2.4	secondary	11	44	55
Statham	1.0	primary	17	67	84
Stockbridge	1.2	secondary	60	185	245
Stone Mountain	2.0	secondary	91	37	128
Swainesboro	6.0	secondary	97	539	636
Tennille	2.1	secondary	49	37	86
Unadilla	1.5	secondary	30	31	61
Vidalia	8.2	secondary	91	350	441
Watkinsville	1.0	secondary	33	23	56
Winder	6.0	secondary	78	78	156
Wrightsville	2.2	primary	52	40	92
Totals			3,395	16,157	19,552

*Based on January 1960 constant dollars.

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TABLE P-4
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
ALTAMAHA BASIN

Location by State and County	Code	Type of Waste	Treatment Recommended	Est. Cost of Treatment $1,000
GEORGIA				
Baldwin	B	textile	city sewers	--
	C	meat packing	primary	60
	D	textile dye	city sewers	--
Barrow	E	poultry proc.	stab. pond	--
Bibb	G	wood fibers	sedimentation	55
	H	dye & bleach	city sewers	--
	I	rendering	city sewers	--
	J	acids	pH adjustment	20
	L	clay tailings	settling lagoon	10
	O	creosote oil	oil removal	10
	P	metal plat.	ion exchange	50
Bleckley	Q	meat pkg.	stab. pond	18
Clarke	R	dairy	city sewers	--
Dodge	S	meat packing	stab. pond	14
	U	cannery	stab. pond	48
	V	organic	city sewers	--
Emanuel	W	poultry proc.	stab. pond	15
Jackson	Z	textile dye	stab. pond	20
Jones	BB	textile	primary	25
	CC	cannery	stab. pond	140
Laurens	DD	textile dye	primary	100
	EE	textile dye	primary	650
McIntosh	GG	sea food	screens	5
Newton	HH	textile dye	city sewers	--
	II	textile	city sewers	--
Peach	JJ	cannery	stab. pond	90
Pulaski	KK	bleach	primary	20
Spalding	MM	textile dye	city sewers	--
	NN	textile	city sewers	--
	OO	bleach & dye	stab. pond	200
Twiggs	AAA	kaolin proc.	settling lagoons	40
Washington	TT	clay tailings	settling lagoons	10
	UU	clay tailings	settling lagoons	10
	VV	clay tailings	settling lagoons	10
Wilkerson	ZZ	inorganics & acids	chem. precip.	65
Total				1,700

*Based on January 1960 constant dollars.
(3/15/62)

discharge wastes to the Altamaha Basin. However, future needs have been determined individually for each of the municipalities and institutions outside the Atlanta metropolitan area.

By 1975, the total PE of the sewage before treatment will be 1,214,220 and the estimated PE after recommended treatment will be 243,040, as shown by Table P-5. By the year 2000, the total PE of the sewage before treatment will be 2,071,200 and the estimated PE after recommended treatment will be 389,840 as shown by Table P-5.

As shown by Table P-6, industrial wastes discharged by 32 industries will have a total PE before treatment of 839,520 and 1,105,770 by 1975 and 2000, respectively. These wastes will have an estimated total PE after recommended treatment of 153,600 and 190,500 by 1975 and 2000, respectively. These figures do not include 18 industries for which waste discharges are either undetermined or of an inorganic nature. It is assumed that all other industries in the Basin will discharge wastes to subsurface systems, evaporation ponds or to municipal sewerage systems.

SEWERAGE

Assuming that sewerage requirements for 1960 will have been met, additional sewerage construction will be required in 64 municipalities between 1960 and 1975. These 64 municipalities will require extension of the sewage collection systems required for 1960 to serve an additional 296,000 persons. As shown by Table P-7, the total capital outlay required for extension of sewerage systems between 1960 and 1975 is estimated to be $14,827,000.

Between 1975 and 2000, there will be a need for sewerage construction in 71 municipalities. These municipalities will require extension of the sewage collection systems recommended in 1960 and 1975 to serve an additional 718,340 persons. As shown by Table P-7, the total outlay required for extension of the sewage collection systems required to meet the needs between 1975 and 2000 is estimated to be $35,917,000.

TREATMENT FACILITIES

The degree of treatment required at each municipality, institution, and industry has been determined on the basis of dilution water available during periods of low stream flow and/or downstream water use. In the upstream areas where low flows are not sufficient to protect water quality after secondary treatment, low flow augmentation is recommended. However, primary treatment only has been recommended for wastes discharged to tidewater. In the Atlanta metropolitan area, available data was not sufficient to determine dilution water requirements. However, because of the size of the area, and the volume and strength of the municipal and industrial wastes discharged, a minimum of secondary treatment for all wastes in the area was considered reasonable. These areas are discussed more fully in the LOW FLOW AUGMENTATION section of this memorandum.

The sewage treatment facilities recommended for 1960 in 51 municipalities will be adequate to meet the needs between 1960 and 1975. Twenty-one other municipalities, however, will need to enlarge either their existing treatment facilities or those recommended for 1960 to meet needs between 1960 and 1975. Of the 21 plant enlargements recommended, 5 are for primary plants, 13 for secondary plants and 2 for stabilization ponds. One municipality will need to enlarge both its primary and secondary plants. The total capital outlay required for municipal sewage treatment plant construction between 1960 and 1975 is estimated to be $15,450,000 as shown by Table P-7.

Existing treatment facilities or those recommended for 1960 will be adequate to meet 1975 needs for 22 industries. However, 20 industries will need additional waste treatment facilities between 1960 and 1975. The total capital outlay required for this construction is estimated to be $755,000 as shown by Table P-8.

Sewage treatment facilities recommended for 19 municipalities for 1975 will need to be enlarged to meet the needs between 1975 and 2000. In addition, 34 municipalities will need to enlarge their existing or recommended 1960 plants and 7 municipalities will need to construct new plants to meet 2000 needs. The total capital outlay required for municipal sewage treatment facilities needed between 1975 and 2000 is estimated to be $39,583,000 as shown by Table P-7.

The waste treatment facilities of 24 industries will need to expand between 1975 and 2000. The total capital outlay required for this expansion is estimated to be $1,207,000 as shown by Table P-8.

TABLE P-5
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
ALTAMAHA BASIN

Municipality	1975 Treatment Recommended	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Treatment Recommended	2000 PE Untreated Waste	2000 PE Discharged Waste
GEORGIA						
Abbeville	secondary	850	130	secondary	700	100
Adrian	--	--	--	secondary	920	140
Almo	secondary	950	140	secondary	1,200	180
Allentown	--	--	--	secondary	800	120
Athens #1	secondary	72,000	11,000	secondary	96,000	14,500
#2	primary	23,000	15,000	primary	32,000	21,000
Atlanta Metropolitan Area						
Clayton Co.	secondary	20,000	3,000	secondary	75,000	11,000
DeKalb Co.	secondary	200,000	30,000	secondary	475,000	71,000
Fulton Co.	secondary	350,000	52,500	secondary	600,000	90,000
Gwinnett Co.	secondary	25,000	3,800	secondary	130,000	19,500
Barnesville	secondary	6,350	950	secondary	8,550	1,290
Byron	primary	2,170	1,400	primary	4,000	2,600
Cadwell	secondary	470	80	secondary	760	110
Chicopee	secondary	1,500	220	secondary	1,500	220
Cochran	secondary	5,200	780	secondary	8,000	1,200
Conyers	secondary	3,250	490	secondary	5,700	850
Covington	secondary	9,000	1,350	secondary	15,000	2,250
Darien	primary	2,000	1,300	primary	3,000	1,950

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TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
ALTAMAHA BASIN

Municipality	1975			2000		
	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
GEORGIA - Cont'd						
Dublin	primary	19,000	12,500	primary	25,000	16,000
V.A. Hospital	secondary	2,000	300	secondary	2,000	300
East Dublin	primary	1,800	1,180	primary	2,400	1,560
Eastman	secondary	5,400	810	secondary	7,500	1,150
Eatonton	secondary	3,800	570	secondary	6,000	900
Elberta	--	--	--	secondary	1,000	150
Forsyth	secondary	4,800	720	secondary	7,200	1,100
Fort Valley	secondary	8,600	1,300	secondary	10,000	1,500
Glennville	secondary	2,900	440	secondary	5,000	750
Glenwood	--	--	--	secondary	865	130
Gordon	secondary	2,200	330	secondary	2,800	420
Gray	secondary	1,870	280	secondary	2,400	360
Greensboro	secondary	3,200	480	secondary	3,900	580
Griffin (part)	secondary	25,000	3,750	secondary	38,000	5,700
Hawkinsville	primary	5,400	3,500	primary	7,000	4,500
Hazelhurst	secondary	4,500	680	secondary	6,500	980
Helena	secondary	1,500	230	secondary	1,900	290
Irwinton	--	--	--	secondary	850	130
Jackson	secondary	2,700	410	secondary	3,100	470
Jefferson	secondary	1,900	280	secondary	2,100	320
Jeffersonville	secondary	1,200	180	secondary	1,700	250

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TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
ALTAMAHA BASIN

Municipality	1975 Treatment Recommended	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Treatment Recommended	2000 PE Untreated Waste	2000 PE Discharged Waste
GEORGIA - Cont'd						
Jesup	secondary	8,000	1,200	secondary	12,500	1,880
Loganville	secondary	1,100	120	secondary	1,500	220
Ludowici	secondary	2,000	300	secondary	3,600	540
Lumber City	primary	1,550	1,000	primary	1,900	1,250
Lyons	secondary	3,800	570	secondary	5,800	870
McDonough	secondary	2,600	390	secondary	4,000	600
McRae	primary	3,500	2,280	primary	4,500	2,900
Macon	secondary	175,000	26,400	secondary	200,000	30,000
Madison	secondary	3,100	470	secondary	4,000	600
Milan	primary	1,050	690	secondary	1,735	260
Midway-Hardwick	primary	5,700	3,700	primary	9,200	6,000
Milledgeville	primary	35,500	23,000	primary	40,000	26,000
State Hospital	primary	15,000	9,750	primary	20,000	13,000
Colony Farm	secondary	400	60	secondary	500	80
Milstead	secondary	1,000	150	secondary	800	120
Monroe	secondary	32,000	4,800	secondary	35,000	5,250
Monticello	secondary	2,100	310	secondary	2,500	380
Mt. Vernon	primary	1,430	920	primary	2,000	1,300
Nicholson	--	--	--	secondary	1,000	150
Oxford	secondary	1,460	220	secondary	2,400	360
Emory-at-Oxford	primary	400	250	primary	400	250

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TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
ALTAMAHA BASIN

	1975			2000		
Municipality	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
GEORGIA - Cont'd						
Pepperton	secondary	750	110	primary	800	120
Perry	secondary	11,000	1,600	secondary	15,000	2,250
Porterdale	primary	2,500	1,600	primary	3,500	2,300
Reidsville	secondary	1,560	240	secondary	2,340	350
Reidsville Prison	secondary	3,500	520	secondary	3,500	520
Robins AFB	secondary	10,000	1,500	secondary	10,000	1,500
Rutledge	--	--	--	secondary	1,600	240
Sandersville	secondary	5,600	840	secondary	8,500	1,270
Social Circle	secondary	1,800	270	secondary	1,850	280
Soperton	secondary	2,600	390	secondary	3,800	570
Sparta	secondary	2,100	310	secondary	2,400	360
Statham	primary	830	540	primary	1,070	700
Stockbridge	secondary	2,100	310	secondary	3,500	530
Swainesboro	secondary	7,200	1,080	secondary	8,500	1,270
Tennille	secondary	1,900	290	secondary	2,100	310
Toomsboro	secondary	830	120	secondary	920	140
Unadilla	secondary	1,350	200	secondary	1,450	220
Vidalia	secondary	8,200	1,230	secondary	12,500	1,880
Warner Robins	secondary	25,000	3,750	secondary	27,500	4,150
Watkinsville	secondary	1,010	150	secondary	1,630	240
Winder	secondary	6,000	900	secondary	7,500	1,130
Wrightsville	primary	2,200	1,430	primary	2,600	1,700
Totals		1,214,220	243,040		2,071,200	389,840

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TABLE P-6
SOURCES OF INDUSTRIAL WASTE - 1975 AND 2000
(Excludes industries connected to municipal sewer systems)
ALTAMAHA BASIN

Location by State and County	Code	Treatment Recommended	1975			2000		
			Vol. of Waste mgd	PE Untreated Waste	PE Discharged Waste	Vol. of Waste mgd	PE Untreated Waste	PE Discharged Waste
GEORGIA								
Baldwin	C	primary	0.014	1,780	1,140	0.016	2,000	1,300
Barrow	E	stab. pond	0.410	15,500	2,300	0.500	18,400	2,750
	F	chemical-pH adj.	0.050	--	--	0.150	--	--
Bibb	G	settling lagoon	1.790	undet	undet	2.600	undet	undet
	J	chemical-pH adj.	0.205	--	--	0.285	--	--
	L	settling lagoon	0.100	--	--	0.150	--	--
	M	aeration-stab.pond	22.800	200,000	30,000	33.500	290,000	43,500
	N	pH adj.	0.094	--	--	0.124	--	--
	O	oil removal	0.037	--	--	0.051	--	--
	P	ion exchange	0.330	--	--	0.850	--	--
Bleckley	Q	stab. pond	0.140	2,500	400	0.170	3,100	470
Dodge	S	stab. pond	0.020	1,600	240	0.025	2,000	300
	U	stab. pond	0.058	11,500	1,700	0.072	14,400	2,200
Emanuel	W	stab. pond	0.068	1,950	300	0.085	2,460	380
Jackson	Z	stab. pond	0.292	undet	undet	0.250	undet	undet
Jasper	AA	settling lagoons	1.520	--	--	2.540	--	--
Jones	BB	primary	0.020	undet	undet	0.015	undet	undet
	CC	stab. pond	1.040	68,000	10,000	1.250	83,000	12,500
Laurens	DD	primary	0.970	8,000	5,200	0.820	6,750	4,400
	EE	primary	3.000	47,000	30,000	2.550	40,000	26,000
McIntosh	GG	screens	0.495	undet	undet	0.620	undet	undet
Peach	JJ	stab. pond	0.480	32,000	4,800	0.580	39,000	5,900
Pulaski	KK	primary	0.073	190	120	0.060	160	100
Spalding	OO	stab. pond	1.950	76,500	11,400	1.640	64,500	9,700
Twiggs	SS	settling lagoons	1.190	--	--	1.840	--	--
	AAA	settling lagoons	undet	--	--	undet.	--	--
Washington	TT	settling lagoons	0.017	--	--	0.025	--	--
	UU	settling lagoons	0.295	--	--	0.460	--	--
	VV	settling lagoons	0.035	--	--	0.052	--	--
Wayne	XX	aeration&stab.pond	59.600	373,000	56,000	87.000	540,000	81,000
Wilkerson	YY	settling lagoons	3.000	--	--	4.650	--	--
	ZZ	chemical & settling	1.390	--	--	2.140	--	--
Totals (3/15/62)			102.320	839,520	153,600	145.070	1,105,770	190,500

TABLE P-7
MUNICIPAL POLLUTION ABATEMENT ESTIMATED COSTS* - 1975 AND 2000 ALTAMAHA BASIN

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
GEORGIA						
Adrian	--	--	--	46	22	68
Almo	6	--	6	13	--	13
Allentown	--	--	--	40	20	60
Athens	332	1,900	2,232	600	2,100	2,700
Atlanta						
Metropolitan Area						
Clayton Co.	540	1,440	1,980	2,710	2,900	5,610
DeKalb Co.	6,170	5,000	11,170	11,975	10,000	21,975
Fulton Co.	2,760	--	2,760	10,000	10,000	20,000
Gwinnett Co.	717	1,300	2,017	4,230	4,700	8,930
Barnesville	44	--	44	110	--	110
Byron	50	100	150	91	152	243
Cadwell	6	--	6	14	12	26
Cochran	24	--	24	140	51	191
Conyers	11	--	11	120	316	436
Covington	41	--	41	150	545	695
Darien	21	--	21	50	103	153
Dublin	69	270	339	240	350	590
East Dublin	6	--	6	30	75	105
Eastman	14	--	14	105	270	375
Eatonton	9	--	9	110	290	400
Elberta	--	--	--	50	23	73
Forsyth	45	50	95	120	290	410
Fort Valley	15	--	15	70	--	70
Glennville	5	--	5	105	166	271
Glenwood	--	--	--	43	21	64
Gordon	20	--	20	30	115	145
Gray	28	--	28	26	16	42
Greensboro	21	--	21	35	125	160
Griffin	231	540	771	650	1,000	1,650
Hawkinsville	17	--	17	85	140	225
Hazelhurst	17	140	157	100	267	367
Helena	10	--	10	20	14	34
Irwinton	--	--	--	43	21	64
Jackson	8	165	173	20	--	20
Jefferson	7	--	7	10	12	22
Jeffersonville	11	--	11	24	13	37

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TABLE P-7 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
ALTAMAHA BASIN

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
GEORGIA - Cont'd						
Jesup	35	--	35	100	500	600
Loganville	9	--	9	20	--	20
Ludowici	20	--	20	80	32	112
Lumber City	9	--	9	18	25	43
Lyons	29	75	104	100	250	350
McDonough	19	--	19	70	218	288
McRae	23	90	113	50	100	150
Macon	2,750	3,000	5,750	1,650	1,685	3,335
Madison	21	90	111	45	150	195
Milan	53	100	153	34	140	174
Midway-Hardwick	70	60	130	175	250	425
Milledgeville	69	--	69	55	125	180
State Hospital	--	--	--	--	147	147
Monroe	14	--	14	145	70	215
Monticello	8	--	8	20	--	20
Mt. Vernon	13	--	13	28	75	103
Nicholson	--	--	--	50	23	73
Oxford	18	8	26	47	21	68
Pepperton	4	--	4	5	--	5
Perry	48	--	48	150	30	180
Porterdale	7	--	7	50	100	150
Reidsville	17	--	17	39	21	60
Rutledge	--	--	--	80	32	112
Sandersville	9	--	9	145	222	367
Soperton	14	--	14	60	185	245
Sparta	9	--	9	15	--	15
Statham	6	--	6	12	--	12
Stockbridge	45	150	195	70	200	270
Swainesboro	63	180	243	65	193	258
Tennille	5	--	5	8	--	8
Toomsboro	41	22	63	5	--	5
Unadilla	3	--	3	5	--	5
Vidalia	31	--	31	90	500	590
Warner Robins	68	770	838	100	100	200
Watkinsville	13	--	13	31	18	49
Winder	22	--	22	75	30	105
Wrightsville	7	--	7	20	12	32
Totals	14,827	15,450	30,277	35,917	39,583	75,500

*Based on January 1960 constant dollars.

(3/15/62)

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TABLE P-8
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
ALTAMAHA BASIN

Location by State and County	Code	Estimated Costs in $1,000	
		1975	2000
GEORGIA			
Baldwin	C	5	5
Barrow	E	35	25
	F	--	20
Bibb	G	--	55
	J	20	--
	L	5	7
	M	125	180
	N	--	20
	O	5	10
	P	55	200
Bleckley	Q	5	6
Dodge	S	5	7
	U	25	25
Emanuel	W	5	7
Jasper	AA	20	35
Jones	CC	80	75
Peach	JJ	43	43
Twiggs	SS	20	25
	AAA	20	25
Washington	TT	--	5
	UU	7	10
	VV	--	7
Wayne	XX	225	335
Wilkerson	YY	30	50
	ZZ	20	30
Totals		755	1,207

*Based on January 1960 constant dollars.

(3/15/62)

LOW FLOW AUGMENTATION

GENERAL

A minimum standard of water quality for fish and aquatic life is a dissolved oxygen content of not less than 4 ppm. In determining the volume of stream flow and storage required to maintain this standard, the following assumptions were used:

1. Summer water temperatures.
2. Minimum flows are 7 day low flows occurring once in 10 years.
3. Physical characteristics and reaeration constant of streams vary as to location, size, etc., of stream.

Minimum stream flows required at locations in the Basin where liquid wastes are discharged were calculated on the basis of the estimated PE for the years 1960, 1975, and 2000. At least primary treatment was assumed for all locations, and if the required dilution flow exceeded the actual low flow, secondary treatment was recommended. The minimum flows are shown in Table P-9. Locations requiring minimum flows of less than 1.0 cfs by the year 2000 are not included in the table.

TABLE P-9
MINIMUM FLOW REQUIREMENTS
ALTAMAHA BASIN

General Location	Receiving Stream	Water Required (cfs)		
		1960	1975	2000
Athens	North Oconee R	6.2	7.2	9.6
Athens[1]	Middle Oconee R	13.6	21.0	29.0
Total for Oconee R at Athens		19.8	28.2	38.6
Atlanta Metropolitan Area (see text)				
Barnesville	Tobesofkee Cr-Ocmulgee R	0.4	0.7	1.0
Bethlehem (Ind)	Marburg Cr-Apalachee R	1.1	1.5	1.8
Cochran	Jordan Cr-Ocmulgee R	1.4	1.6	2.4
Covington-Oxford	Dried Indian Cr-Yellow R	0.9	1.0	1.7
Darien[1]	Altamaha R	23.0	29.0	42.0
Dublin[1]	Oconee R	451.0	444.0	430.5
V.A. Hospital	Hunter & Hardship Cr-Oconee R	1.3	1.3	1.3
East Dublin[1]	Oconee R	10.2	10.8	14.4
Total for Area		462.5	456.1	446.2
Eastman	Sugar Cr-L Ocmulgee R	3.5	3.5	3.6
Eastman	Gum Swamp Cr-L Ocmulgee R	0.9	1.8	3.7
Fort Valley	Bay Cr-Big Indian Cr-Ocmulgee R	9.2	12.3	14.7
Glennville	Brickyard Cr-Beards Cr-Altamaha R	0.8	0.9	1.5
Gordon	L Commissioner Cr-Oconee R	0.5	0.7	1.0
Griffin	Cabin Cr-Ocmulgee R	10.0	10.2	10.3
Haddock (Ind)	Fishing Cr-Oconee R	5.0	6.8	8.3

TABLE P-9 (Cont'd)

General Location	Receiving Stream	Water Required (cfs) 1960	1975	2000
Hawkinsville[1]	Ocmulgee R	30.0	34.0	43.0
Hazelhurst	Branch-Ocmulgee R	1.2	1.4	2.0
Jackson	Yellow Water Cr-Ocmulgee R	0.3	0.3	0.3
Pepperton[1]	Yellow Water Cr-Ocmulgee R	0.8	0.8	0.9
Total for Jackson Area		1.1	1.1	1.2
Jesup (Ind)	Altamaha R	300.0	444.0	650.0
Jesup	McMullen Cr-Altamaha R	2.9	2.4	4.0
Lumber City[1]	Ocmulgee R	8.4	9.3	11.4
Lyons	Swift Cr-Pendleton Cr-Ohoopee R	1.0	1.1	1.7
Macon	Ocmulgee R	77.5	114.0	147.0
McRae[1]	Sugar Cr-L Ocmulgee R	6.4	6.7	9.6
McRae[1]	Gum Swamp Cr-L Ocmulgee R	1.5	1.5	1.5
Milledgeville[1]	Fishing Cr-Oconee R	87.6	89.5	100.8
Midway-Hardwick[1]	trib-Oconee R	10.2	13.7	22.2
Milledgeville State Hospital[1]	Oconee R	31.7	36.0	48.0
Total for Oconee R at Milledgeville		129.5	139.2	170.0
Milan[1, 2]	Turnpike Cr-L Ocmulgee R	--	2.5	0.5
Monroe	Jacks Cr-Apalachee R-Oconee R	0.4	0.4	0.6
Monroe	Mountain Cr-Alcovy R-Ocmulgee R	2.4	2.4	2.5
Mount Vernon[1]	Oconee R	7.2	8.5	12.0
Perry	Indian Cr-Ocmulgee R	2.9	3.3	4.5
Porterdale[1]	Yellow R	2.8	2.8	3.9

TABLE P-9 (Cont'd)

General Location	Receiving Stream	Water Required (cfs)		
		1960	1975	2000
Reidsville State Prison[1]	Ohoopee R	1.2	1.2	1.2
Sandersville	Limestone Cr-Oconee R	0.7	1.7	2.5
Soperton	Tiger Cr-Oconee R	0.7	0.8	1.2
Statham[1,2]	Barber Cr-Oconee R	1.0	1.0	1.0
Swainsboro	br-Yamgrandee Cr-Ohoopee	1.8	2.2	2.5
Toomsboro[1]	Commissioner Cr-Oconee R	--	2.0	2.2
Vidalia	Rocky Cr-Ohoopee	0.7	0.9	2.0
Vidalia	Swift Cr-Pendleton Cr-Ohoopee R	1.6	1.6	2.0
Warner Robins	ditch-Echeconnee Cr	6.5	7.5	8.2
Robins AFB	ditch-Echeconnee Cr	3.0	3.0	3.0
Byron[1]	Echeconnee Cr	3.0	5.2	9.6
Elberta[1]	Echeconnee Cr	--	--	2.4
Total for Echeconnee Cr at Warner Robins		12.5	15.7	23.2
Winder	Marburg Cr-Apalachee R	0.3	1.0	1.1
Winder	Cedar Cr-Mulberry R-Oconee R	0.2	1.0	1.1
Wrightsville[1]	Cedar Cr-Ohoopee R	5.0	5.3	6.2

[1] Primary treatment only

[2] Must provide secondary treatment by 2000

AREAS WHERE AUGMENTATION IS NOT NEEDED

There will be sufficient volumes of water available for adequate dilution (after recommended treatment) and no storage will be needed to maintain stream quality below the points of waste discharge from the following areas: Athens, Bethlehem (Ind), Byron, Darien, Dublin, East Dublin, Elberta, Glennville, Gordon, Hawkinsville, Hazelhurst, Jackson, Macon, Pepperton, Lumber City, Lyons, Milledgeville, Midway-Hardwick, Mt. Vernon, Perry, Porterdale, Reidsville State Prison, Robins AFB, Statham, Toomsboro, Warner Robins, and Wrightsville.

AREAS WHERE AUGMENTATION IS NEEDED

In several areas the streams receiving liquid wastes travel a short distance (1 to 5 miles) before reaching a larger stream with adequate flow. This results in polluted stream conditions for short distances downstream during periods of low flow in the following areas: Barnesville, Jesup, Monroe, Sandersville, Soperton, Vidalia, and Winder. Storage for low flow augmentation or higher degree of treatment to maintain desirable water quality in the short distances involved is not considered the most economical solution to these pollution problems. Studies of alternate solutions such as diversion will be needed in these areas.

Waste discharges in other areas in the Basins will present greater problems, however, and are discussed individually below. In those areas where there is insufficient drainage area to provide needed storage for low flow augmentation and where alternate sources of dilution water are not readily available, further study will be needed to adequately determine the remedial measures required to abate the anticipated pollution.

ATLANTA METROPOLITAN AREA

Although the larger portion of the wastes from the Atlanta metropolitan area (Clayton, Cobb, DeKalb, Fulton, and Gwinnett Counties) is discharged to the Chattahoochee River and Flint River, a sizeable volume is discharged to the headwaters of the South River in the Altamaha Basin and is a source of serious pollution for several miles downstream.

The natural low flow of the South River is not sufficient for adequate dilution after secondary treatment of wastes. Storage for low flow augmentation is not possible on the South River above the points of discharge. Thus, serious degradation of water quality appears unavoidable unless either a larger portion of the wastes is diverted to the Chattahoochee River below Atlanta, or the low flow of the South River is further augmented by nore diversion of water from the Chattahoochee River.

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Because of the complex factors involved, specific minimum stream flow and storage requirements for adequate dilution of each waste discharge from the Atlanta area have not been determined. The data which is available concerning the present and future waste loadings, points of discharge, and physical characteristics of the receiving streams is not considered sufficient for such a detailed analysis.

No adequate comprehensive appraisal of the pollution abatement requirements can be made without a thorough study of the many complex factors affecting water use and water quality in the metropolitan area.

Cochran, Georgia

Wastes from the Cochran area are discharged to Jordan Creek where the natural low flow is approximately 1.0 cfs. The wastes require, after secondary treatment, dilution flows of 1.4 cfs, 1.6 cfs, and 2.4 cfs in 1960, 1975, and 2000 respectively. There is insufficient watershed area above the point of discharge to provide storage. As a result, Jordan Creek will be degraded during periods of low flow for approximately 7 miles to its confluence with the Ocmulgee River.

Covington-Oxford Area

Wastes from Covington and Oxford are discharged to Dried Indian Creek at a point where the natural low flow is 0.5 cfs. The wastes require, after secondary treatment, dilution flows of 0.9 cfs, 1.0 cfs, and 1.7 cfs in 1960, 1975, and 2000, respectively. There is insufficient watershed area above the point of discharge to provide storage. As a result, Dried Indian Creek will be degraded during periods of low flow for approximately 8 miles to its confluence with the Yellow River.

Eastman, Georgia

A large portion of the wastes from Eastman is discharged to Sugar Creek at a point where the low flow is 1.5 cfs. For adequate dilution, the wastes will require, after secondary treatment, stream flows of 3.5 cfs in 1960 and 1975, and 3.6 cfs in 2000. There is insufficient watershed on Sugar Creek to provide water for low flow augmentation. As a result, approximately one-half of the waste now being discharged to Sugar Creek should be diverted one-half mile to Gum Swamp Creek to avoid serious pollution during periods of low flow. The natural minimum flow of Gum Swamp Creek is 15 cfs which is ample to protect water quality.

Fort Valley, Georgia

Wastes from Fort Valley are discharged to Bay Creek at a point where the natural minimum flow is 0.7 cfs. For adequate dilution, the wastes will require after secondary treatment, stream flows of 9.2 cfs, 12.3 cfs, and 14.7 cfs in 1960, 1975, and 2000, respectively. The watershed above the point of discharge will not produce the needed water for low flow augmentation.

To avoid severe degradation of water quality of Bay Creek and Indian Creek as far downstream as Perry, Georgia, water should be diverted approximately 3 miles from Mossy Creek to Bay Creek during periods of low flow. The required reservoir capacity on Mossy Creek is 100 acre-feet in 1960, 700 acre-feet by 1975, and 1600 acre-feet by 2000.

Griffin, Georgia

The larger portion of the wastes from Griffin is discharged to Cabin Creek in the Ocmulgee Basin at a point where the natural minimum flow is 1.3 cfs. The wastes will require, for adequate dilution after secondary treatment, stream flows of 10.0 cfs, 10.2 cfs, and 10.3 cfs in 1960, 1975, and 2000, respectively. Insufficient watershed is available on or near Cabin Creek to provide the necessary water for low flow augmentation.

A portion of the wastes should be diverted to Shoal Creek in the Flint River watershed. However, Cabin Creek will be unavoidably degraded during periods of low flow approximately 10 miles to the point where it reaches the Towaliga River.

Haddock, Georgia

Industrial wastes from the Haddock Area in Jones County are discharged to Fishing Creek at a point where the natural minimum flow is 0.8 cfs. For adequate dilution, after secondary treatment, the wastes will require stream flows of 5.0 cfs, 6.8 cfs, and 8.3 cfs in 1960, 1975, and 2000, respectively. The watershed above the point of discharge is not sufficient to provide water for low flow augmentation. As a result, Fishing Creek will be severely polluted during periods of low flow for a distance of 14 miles to its confluence with the Oconee River at Milledgeville.

McRae, Georgia

The major portion of the wastes from the McRae area is discharged to Sugar Creek at a point where the natural low flow is approximately 6 cfs. These wastes require, after primary treatment, 6.4 cfs, 6.7 cfs, and 9.6 cfs in 1960, 1975, and 2000, respectively.

To avoid the extra expense of providing secondary treatment, a large portion of these wastes could be diverted a short distance to the Little Ocmulgee River where ample dilution water is available. If this diversion is not feasible, secondary treatment is recommended for all wastes discharged to Sugar Creek.

Swainsboro, Georgia

The wastes from Swainsboro are discharged to a branch tributary to Yamgrandee Creek at a point where the natural low flow is approximately 1.0 cfs. The wastes require, after secondary treatment, 1.8 cfs, 2.2 cfs, and 2.5 cfs in 1960, 1975, and 2000, respectively. There is insufficient watershed on or near Yamgrandee Creek to provide the necessary water for low flow augmentation. To avoid serious degradation of Yamgrandee Creek, a large portion of the wastes could be diverted approximately 5 miles to Canoochee Creek in the Ogeechee Basin where ample stream flow is available.

TABLE P-10
RESERVOIR STORAGE NEEDS
ALTAMAHA BASIN

General Location	1960	1975	2000
Barnesville	not economically feasible		
Cochran	no drainage area		
Covington-Oxford	no drainage area		
Eastman	divert to Gum Swamp Cr		
Fort Valley	100	700	1600
Griffin	no drainage area		
Haddock	no drainage area		
Jesup	not economically feasible		
McRae	divert to L. Ocmulgee R		
Monroe	not economically feasible		
Sandersville	not economically feasible		
Soperton	not economically feasible		
Swainsboro	divert to Canoochee Cr		
Vidalia	not economically feasible		
Winder	not economically feasible		

ANNUAL COSTS AND BENEFITS

FINANCING

Municipalities can finance sewage works construction by general obligation bonds, revenue bonds, special assessments, or some combination of these methods. The Georgia law permits the issuance of general obligation bonds to be repaid within 30 years, up to a maximum amount of 7 percent of the evaluation of taxable property within the political subdivision. The law permits an increase of this bonded indebtedness of 3 percent of the evaluation of the taxable property provided the increased indebtedness shall be repaid within a five-year period and is approved by the General Assembly.

Georgia law authorizes the State to make grants to any county or municipality if funds are available to assist in pollution abatement projects that qualify for Federal aid under Public Law 660. The State grants are limited to 30 percent of that portion of the construction costs which qualify under the Federal aid program or $250,000, whichever is smaller. To date, however, no grants have been made by the State.

Financial aid is available to municipalities in the form of Federal grant assistance under Public Law 660 as amended. The Federal Government will pay up to 30 percent of the estimated reasonable cost of construction of municipal sewage treatment works or $600,000, whichever is smaller. Eligible for assistance are construction of new treatment works, improvements to existing treatment facilities, intercepting sewers, outfall sewers, pumping, and such preliminary planning necessary for construction. To date, Athens, DeKalb County, Barnesville, Lawrenceville and Vidalia have participated in the Federal aid program constructing interceptor sewers and/or sewage treatment plants. Applications have been received and approved and Federal grant offers have been made to Cochran, Gordon, Norcross, DeKalb County, Atlanta, Macon, McRae, and Athens.

Industries will undoubtedly finance their pollution abatement facilities with private capital by the most economical methods available to them at the time of construction.

ANNUAL COSTS FOR 1960

The annual cost of pollution abatement by municipalities and industries in the Basin in 1960 is estimated to be $4,563,600. This includes the annual equivalent capital cost of existing facilities in 1960, annual replacement, and operation and maintenance cost of existing facilities. A breakdown of the total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$3,113,000	$101,600
Annual replacement cost	0	0
Annual operation and maintenance cost	1,233,000	116,000
Total annual cost (1960)	$4,346,000	$217,600

The total capital outlay required to improve existing pollution abatement facilities to meet the 1960 needs is estimated to be $19,552,000 for 69 municipalities and $1,700,000 for 25 industries. These costs are shown in Tables P-3 and P-4.

ANNUAL COSTS BY 1975

The total capital outlay required for additonal pollution abatement facilities needed by 1975 after 1960 needs have been met, is estimated to be $30,277,000 for 64 municipalities and $755,000 for 20 industries. These costs are shown in Tables P-7 and P-8.

The annual cost of pollution abatement by municipalities and industries by 1975 is estimated to be $8,025,200. This includes the annual equivalent capital cost of (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet 1975 needs. The replacement cost is based on the total investment by 1975 and the operation and maintenance cost is based on existing and recommended facilities as of 1975. A breakdown of total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital costs	$5,532,700	$220,800
Annual replacement cost	0	0
Annual operation and maintenance cost	2,063,700	208,000
Total annual cost (1975)	$7,596,400	$428,800

ANNUAL COSTS BY 2000

The total capital outlay required for additional pollution abatement facilities needed between 1975 and 2000 is estimated to be $75,500,000 for 72 municipalities and $1,207,000 for 24 industries. These costs are shown in Tables P-7 and P-8.

The annual cost of pollution abatement by municipalities and industries by 2000 is estimated to be $13,216,100. This includes the equivalent capital cost, the replacement cost, and the operation and maintenance cost of existing facilities and all recommended improvements for 1960, 1975, and 2000. A breakdown of total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$9,199,000	$279,400
Annual replacement cost	0	0
Annual operation and maintenance cost	3,470,700	276,000
Total annual cost (2000)	$12,669,700	$546,400

BENEFITS

It is recognized that pollution control results in benefits to public health and to those economic activities associated with the use of water of improved quality. However, because there is no established market value for water as a commodity sold in a competitive market, monetary benefits from improvement in quality of water now used or anticipated to be used in the future from public or private sources in the Altamaha Basin are indeterminate. While pollution abatement does enhance fishing and recreational opportunities, protect health, preserve and improve property and aesthetic values, and assure future utility of water resources, these values are confined largely to the intangible or social realm.

Ordinarily for those functions for which no market values are clearly established their values may in some cases be derived or estimated indirectly from prices established in the market for similar or analagous effects or may be derived from the most economical cost of producing similar effects by an alternative means. In the case of pollution abatement, however, there are no established prices for similar effects since no analagous effect exists. Neither are there alternative means of providing similar effects since, in most cases, the most likely, least cost means of attaining the desired effects is used. Therefore, lacking adequate methodology for assessing social values, benefits from pollution abatement must, for the time being, be considered as intangible. In the absence of established or synthetic market values, since the benefits from pollution abatement are real although intangible, it is considered that benefits accruing from pollution control by conventional treatment processes are at least equal to the cost of providing the facilities.

Since knowledge of society's future needs is less complete and accurate than information of present requirements, there could well be a tendency to adopt a water quality standard that is at times too high. Such has not been the case in the development of costs in this memorandum, however, because only minimum requirements or needs have been expanded into the future.

SUMMARY

1960

At the present time there are 68 municipalities (which includes 9 institutions) and 42 industries which discharge wastes, treated and untreated, into the surface waters of the Altamaha Basin.

The total volume of municipal and industrial wastes discharged to the waters of the Basin is estimated to be 139.7 mgd and the total PE 1,409,200 before treatment and 858,000 after treatment.

The existing (1960) total annual cost of pollution abatement by municipalities and industries in the Basin is estimated to be $4,563,600.

1975

By 1975, 74 municipalities and institutions and 32 industries are expected to discharge wastes to the surface waters of the Altamaha Basin. The total PE of these wastes is estimated to be 3,053,740 before treatment and 396,640 after recommended treatment.

Reservoir storage for low flow augmentation will be needed in one area by 1975. In 4 areas, receiving streams will not have sufficient drainage area to allow storage for low flow augmentation and thus polluted water conditions will exist during natural low flow periods some 5 to 15 miles downstream. In 7 areas, the size and length of the receiving streams is such that low flow augmentation during periods of low flow would not be economically feasible and thus severely polluted conditions are expected to exist for short distances downstream. Diversion of wastes to nearby streams where low flows will be adequate to dilute wastes after secondary treatment is recommended in three areas.

The total annual cost of pollution abatement by municipalities and industries by 1975 is estimated to be $8,025,200. This total includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 needs.

2000

By 2000, 81 municipalities and institutions and 32 industries are expected to discharge wastes to the surface waters of the Altamaha Basin. The total PE of these wastes is estimated to be 3,177,000 before treatment and 580,300 after recommended treatment.

Reservoir storage will be needed in one area in the Basin by 2000. As in 1975, 4 areas which have insufficient drainage area to allow storage will be polluted for 5 to 15 miles downstream and in 7 other areas low flow augmentation will not be economically feasible and thus polluted conditions are expected to exist in localized areas.

The total annual cost of pollution abatement by municipalities and industries by 2000 is estimated to be $13,216,100. This value includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 and 2000 needs.

PH-1

PUBLIC HEALTH

INTRODUCTION

This Technical Memorandum is written with the limitation that field data were not available for all phases. Presentation of data in the subject areas of Vector Control and Solid Wastes is based upon published material and on field studies done by the Communicable Disease Center of the Public Health Service. The information is general and portions cannot be applied specifically to the Basin, but their presentation will serve as a guide to the solution of Basin problems as well as broader State and Regional problems.

This Technical Memorandum, for clarification, has not attempted to divide the Public Health problems and solutions according to the population distributions of the heavily populated counties in the Altamaha and Apalachicola-Chattahoochee-Flint Basins. In general, those problems occurring in Clayton, DeKalb and Gwinnett Counties are covered in this Technical Memorandum while those occurring in Fulton and Hall Counties are covered in the Technical Memorandum for the Apalachicola-Chattahoochee-Flint Basin.

VECTOR CONTROL

INTRODUCTION

Vector problems and control efforts in this Basin may be subdivided into two segments -- urban and rural. In this study selected towns in the Basin over 1,000 population were grouped into the urban setting. A few towns have modest mosquito larviciding and adulticiding programs. In the rural areas, vector problems (except for 5- to 10-mile range fresh-water flood mosquitoes) are mostly associated with the activities of the individuals who solve them on an individual basis. Several local health departments carry on modest county-wide rodent control programs.

For long-range planning concerning land and water uses, emphasis has been given to recommendations that would result in an environment by the year 2000 that would require only a minimum of repetitive pesticide application. This will not only minimize the cost of vector control programs to the public but will make them more effective.

EXISTING VECTOR PROBLEMS

Eastern encephalitis ("sleeping sickness") in the past has caused serious losses among horses in the Basin. Mosquito vectors of this highly fatal human and horse disease are most prevalent in the swamps and marshes located close to and along the coast.

In recent years primary local malaria transmission has been at extremely low levels. The number of malaria mosquitoes, *Anopheles quadrimaculatus*, remains about the same in the Basin as in years when malaria was prevalent. Travelers may bring malaria parasites back to this country from malarious areas of the earth and cause malaria transmission in the Basin. Thus, a continuance of mosquito control efforts coupled with surveillance will be required for many years. Fresh-water pools and ponds with vegetation are favorite breeding places for malaria mosquitoes.

Typhus fever (flea-borne) also was a severe problem in Georgia during the 1930's and 1940's. During recent years improved sanitation practices (limiting the domestic rat's food and harborage) and the use of newer rat poisons and flea insecticides have reduced transmission of typhus fever to low levels. Only a few cases occur each year in Georgia; 8 in 1959. The pest control industry has played an important role in halting typhus transmission in the urban setting. Most of the remaining transmission of this disease appears to take place in rural areas.

There is considerable transmission of various enteric infections by house flies. Determination of precise case rates is difficult because of many factors, including poor reporting, difficulties of diagnosis, and many patients not seeking medical help.

Rocky Mountain spotted fever occurs occasionally in Georgia. Increased use of recreational areas and construction of suburban housing areas appear to increase the possibility of American dog ticks transmitting Rocky Mountain spotted fever to humans. It is noteworthy that in eastern United States the incidence of this disease has been highest among vacationists and picnickers, particularly among women and children.

Conjunctivitis (pink eye), a common disease of younger children, is a considerable problem in the non-coastal portions of the Basin and is confined largely to rural areas. One mode of transmission of this disease is by eye gnats (*Hippelates*). Oviposition of these insects occurs in freshly cultivated or otherwise disturbed soil.

The coastal area of this Basin with extensive tidal marshlands is notorious for biting insects. Salt-marsh mosquitoes occur in large numbers and cause great annoyance to residents and visitors. At times these insects occur in such overwhelming numbers that outdoor activities during the day or night are practically impossible. Large broods of salt-marsh mosquitoes frequently occur following unusually high tides or heavy rains.

Fresh-water swamps, marshes, and low-lying areas that receive floodwater are also important sources of mosquitoes.

Sand flies, deer flies, horseflies, and other biting insects occasionally occur in great numbers causing extreme annoyance to residents and visitors.

Throughout the Basin, numerous small patches of alligatorweed and water hyacinths are found in small ditches and drainage creeks. Both of these obnoxious weeds were introduced to the United States from tropical areas and are spreading throughout the Basin. Profuse growths of these weeds tend to clog drainage ditches, canals, ponds, etc., creating conditions favorable for malaria mosquitoes. Many other similar aquatic plants are profusely present. Extensive Federal programs are underway for eradication of obnoxious aquatic weeds.

(6/1/62)

In urban areas, vector problems are frequently associated with improper disposal of sewage. Severe Culex mosquito problems have developed where communities discharge improperly treated sewage wastes into swampy or impounded areas near town. In about 15 percent of the towns studied, overflowing septic tanks are a problem, and create ideal places for the breeding of Culex mosquitoes. Sewage stabilization ponds are beginning to appear in the Basin and could cause mosquito breeding problems unless they are properly operated and maintained free from weeds.

Housefly, rodent, and roach problems in cities are usually associated with inadequate refuse storage and disposal practices. In addition, many business and residential lots are littered with garbage, tin cans, bottles, tires, worthless lumber, and other discarded junk. Refuse collection schedules are mostly adequate. Daily service in business areas and twice weekly service in residential areas is needed for effective vector control. Many towns have only once a week pickup service in residential areas. A few of the larger counties have commendable county-wide refuse collection systems. Refuse disposal practices are deficient in many portions of the Basin. Illegal dumping along county roads was mentioned as a problem by several local directors of sanitation.

About 25 percent of the homes in the urban areas do not meet minimum sanitation standards and thus have associated fly, rat, and mosquito problems. Local directors of sanitation are aware of vector problems in substandard housing and the need for corrective programs. Fulton County, Georgia has about 35 to 40 rat bite reports per year, all reported from substandard homes (rodent control efforts have reduced this rate from 80 per year in the past several years). One local health department sanitarian reports considerable sanitation and vector troubles with "shell" homes. Comprehensive minimum housing programs are needed in all the towns of this Basin.

Culex mosquitoes and roaches breed in catch basins in towns. Metropolitan Atlanta has thousands of catch basins which can breed mosquitoes unless treated by County Health Department spray crews. St. Louis encephalitis was caused in Louisville, Kentucky essentially by Culex mosquitoes breeding in catch basins.

Excessive breeding of Culex mosquitoes in storm water surface ditches is reported by several local health department sanitarians. Future consideration should be given to paving the bottoms and sides of storm water ditches.

The management of water in rural areas give rise to a variety of insect vector problems. Inadequacies of general drainage construction and maintenance contribute to mosquito breeding. Most small creeks, canals, and drainage ditches receive little or no maintenance. Frequently, individual farmers and towns are not able to construct the small drainage ditches necessary because of the lack of or clogging of the large drainage canals in the county system.

Dredge spoil activities conducted by the U. S. Army Corps of Engineers create salt-marsh mosquito breeding problems along the eastern United States coast. A great portion of the material dredged from the bottom of the intracoastal water way and associated harbor navigation channels is a clayish muck in which large cracks form when drying. These large cracks form an ideal mosquito breeding place, especially for the severe biting salt-marsh mosquito, *Aedes sollicitans*. A number of ditches in the Basin are constructed with continuous spoil banks on both sides. This results frequently in mosquito breeding because of the lateral blockage of surface water.

Recently increased construction rates of large impoundments in southeastern United States is viewed with concern by State boards of health with regard to possible encephalitis transmission. Of particular concern is the large shallow water reservoir in which aquatic vegetation and mosquitoes can grow profusely.

There are numerous farm ponds in this Basin and many more are being constructed each year. Mosquito breeding in these farm ponds has not been serious due to the present construction and operating procedures. Several local health department directors of sanitation stated that most farm ponds in their areas were constructed in low swampy areas that formerly bred many fresh-water flood mosquitoes but that the construction of these farm ponds has reduced mosquito annoyance in the area by changing mosquitoes from fresh-water flood species to permanent fresh-water species.

Irrigation (sprinkler type) is increasing and is used principally during periods of dry weather for such crops as tobacco, corn and for pastures. No significant mosquito problems have developed from the proper application of irrigation water to the fields.

Local sanitarians report the existence of several wastefully flowing artesian wells. Known mosquito production associated with artesian wells has not been heavy.

Vector problems associated with land resource activities also include those related to the production of livestock and poultry.

Hog parlors are beginning to spring up all over the Southeastern States. A common practice is to wash waste accumulations from the concrete floors of the parlors to an open septic tank. The overflow discharges into the nearest low, swampy area. This method of disposal frequently causes extensive housefly breeding. Hog parlors may have considerable rat infestations.

Chicken "factories" are found in the Southeast and large numbers of them are found in the Basin. In egg factories, the birds are usually kept in small elevated cages, beneath which cones of manure accumulate on dirt floors. Major fly and rodent problems frequently develop where there is poor housekeeping. In another type of egg and chicken factory, the chickens are kept on a deep bed of wood shavings which is removed only occasionally. Waste chicken feed from a power conveyor and water wastage plus the accumulation of manure creates a favorable breeding place for flies.

Solid waste material (principally manure) on farms is being produced in increasing amounts and requires frequent spreading on fields for sanitary disposal without creating a fly problem. The spreading of such wastes on fields at frequent intervals may be difficult due to crop growing requirements and manpower requirements.

A few fire ant mounds were noted in the Basin. Several counties have or have had chemical control programs. Fire ant stings, usually quite rare in man are severe and have caused a few human deaths. The mounds are not only unsightly but detrimental to agricultural operations. Wildlife and public water supplies, however, must be protected in chemical control programs.

STATUS OF EXISTING PROGRAMS

There is no statewide enabling legislation for mosquito or other vector control districts in Georgia, although local governmental units have authority by a State law to do mosquito control work.

Georgia has specific health regulations pertaining to the impounding of water. Permits are issued for farm ponds constructed to comply with State Board of Health regulations.

Supportive services for vector control operations include:

1. Surveillance. Health agencies are concerned with a continuing analysis of vector problems to guide the efforts of other activities.

2. Research. The Florida State Board of Health has a large entomological research center at Vero Beach, Florida, which

is working on the control of insects affecting human health and happiness. Research on vector control is also being carried on at two Federal stations in the Southeast -- the Orlando, Florida laboratory of the Entomology Research Division (USDA) and the Technical Development Laboratories of the Communicable Disease Center (PHS), Savannah, Georgia. In Pensacola, Florida, the Public Health Service, in cooperation with the involved State and local health departments, is attempting to eradicate the yellow fever mosquito, *Aedes aegypti*. Now in its third year of operation, the project is making excellent progress toward the eradication goal. Public education, environmental sanitation, and DDT residual premises spraying methods are being utilized.

3. Technical assistance. Health agencies provide technical assistance to the construction and operating agencies in planning and carrying out vector control operations. Local sanitarians give technical advice and assistance to local communities and to individuals.

Present vector control programs consist of a few city mosquito control programs and several small countywide rodent control programs. Most of the city mosquito control activities are given over to adulticiding measures.

Extensive studies on rat problems in Grady, Thomas, Brooks, and Decatur Counties (Georgia) have been made in recent years by the Public Health Service. These studies indicate the many economic and disease prevention values of countywide rodent control programs.

Robins Air Force Base is located in this Basin and has a modest vector control program.

Mosquito control programs are operated on two large power reservoirs in the Basin by the Georgia Power Company. The principal control measure is the use of contract airplanes to spray DDT whenever *Anopheles quadrimaculatus* mosquito counts or annoyance reaches significant levels. Usually, portions of each reservoir are treated every 10 days beginning in late spring and continuing until about October 15.

EXISTING NEEDS

There is a need for more emphasis to mosquito larviciding and permanent control measures. Each county needs at least one dragline for mosquito work. Each city in the district should have from one to several year-round mosquito control workers who would inspect for larvae during the mosquito season, apply larvicides to mosquito breeding areas, operate adulticiding machines occasionally when large mosquito infestations occur, and do maintenance and minor ditch construction during winter months.

Legislative and regulatory needs include:

1. State enabling legislation permitting the establishment of tax-supported county vector control districts in Georgia.

2. Regulations to require the control of wasteful flow from artesian wells.

Needs pertaining to surveillance and technical assistance include:

1. Extensive surveys of vector disease occurrence and vector problems.

2. Increased training of local health department personnel in vector control intelligence.

3. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and related land resource development.

Some major research needs include:

1. Development of better permanent control techniques in salt marshes that will control mosquitoes, sand flies, and other vectors and at the same time be helpful to other interests, such as wildlife conservation.

2. Development of better equipment and methods for constructing and maintaining water management ditches.

3. Improved methods for the sanitary handling of manure and other wastes on livestock and poultry farms including the possible use of stabilization ponds for the disposal of wastes and for irrigation and fertilization.

4. Construction of new catch basins in such a manner that they do not hold water.

5. Development of new or modified chemical formulations which would overcome insecticide resistance problems and not be harmful to water supplies.

6. Development of improved equipment and application techniques for chemical control of vectors in urban areas.

Vector control program needs include:

1. The establishment of mosquito control districts in the following Georgia Counties: McIntosh and Glynn. A system of

contiguous mosquito control districts will be needed to efficiently and economically control salt-marsh mosquitoes, houseflies, and other vectors in the coastal areas. Each district would eventually need about 3 draglines for permanent control work.

2. The intensification of mosquito control programs on large power reservoirs.

3. The development of countywide water management systems and programs.

4. Extention of the use of sanitary landfills to all towns and counties in the Basin. Many low lands exist in the Basin that could be filled profitably using the sanitary landfill method.

5. Further development of countywide refuse collection and disposal systems.

6. Increased implementation of Federal programs by State and local interest to eradicate infestations of alligatorweed and water hyacinths in the Basin.

State aid to organized vector control agencies in the adjacent states of Florida and South Carolina has proven very successful. Sanitary landfill operations also come under the State aid program in Florida and have been most instrumental in starting and continuing these fills. Similar State aid funds and technical assistance are needed in Georgia.

In order that vector control programs be compatible with multipurpose functions, it is essential that there be coordination between all agencies concerned.

POTENTIAL PROBLEMS AND SOLUTIONS

Based on present knowledge, the one vector problem that appears to be on the rise and could be a significant one in the Basin is mosquito-borne encephalitis -- both the Eastern and St. Louis strains. Eastern encephalitis has caused serious losses among horses in the Basin. Sooner or later it could cause epidemics among man, as occurred in New Jersey in 1959 (this constituted New Jersey's first confirmed human cases, even though it had killed horses there for at least 50 years). The Eastern disease occurs principally in areas with vast fresh-water swamps and salt marshes (Coastal Plain).

St. Louis encephalitis -- a human disease -- is not known to have occurred in the basin, but it has recently been reported in Pinellas County, Florida. This disease presents a threat to communities in the Basin that allow uncontrolled production of Culex mosquitoes.

On the basis of current knowledge concerning mosquito-borne encephalitis, the only feasible approach to control of the disease is a program of prevention -- mosquito control for the community (or population groups) and protection against mosquito bites for the individual.

Increases in transmission of enteric infections by houseflies could increase due to changes in agricultural practices together with further "suburbia" developments.

COSTS AND BENEFITS

The principal benefit of any well-organized vector control program is to provide adequate safeguards to public health. This includes freedom of disease and infirmity which is difficult to evaluate in dollars. Recent research studies have shown, expecially in small children, that permanent brain and motor damage frequently result in cases of mosquito-borne encephalitis. The prevention of just one death or case of permanent damage would amply justify the amount of money proposed for vector control work in any one of the towns or counties in the Basin.

Additional benefits of vector control programs would be an acceleration of development and use of waterfront land. It is common knowledge that excessive numbers of salt-marsh mosquitoes, sand flies, and other vectors on such land are an impediment to industrial plants, subdivision developments, and recreational areas.

Another benefit would be to provide economic safeguards, particularly with reference to tourism or resort areas. This is exemplified by the 1959 outbreak of Eastern encephalitis in New Jersey. Although this outbreak involved only 33 human cases with 21 deaths during a two-month period, it was estimated that the episode caused a loss to Atlantic City hotels of $2,000,000.

The estimated costs of needed vector control programs are included in Table PH-1. Studies in the Chatham County, Georgia area have shown that the total cost of the mosquito control program is being substantially balanced by reduced costs to families in the purchase of household sprays, aerosol bombs, and repellents.

The estimated costs of rural rat control programs will be balanced several times by savings from rat damage to stored farm products.

TABLE PH 1
VECTOR PROBLEMS AND PROGRAMS
ALTAMAHA BASIN

Location and 1960 Population	Vector Problem Degree			Approximate Annual Costs of Vector Control Program*		Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
	1	2	3	Present	Needed				
Athens 31,355		M	F R T	None	$20,000	Incinerator and S.L.F.	Moderate	Light	S.L.F. serves entire county
Avondale Estates 1,646		M R	F T	See DeKalb County		S.L.F.	Light	Light	
Buford 4,168		M F	R T	None	3,000	Modified Landfill	Light	Light	
Constitution 1,500		M R	F T	See DeKalb County		S.L.F.	Light	Light	
Covington 8,167		F R	M T	None	5,000	S.L.F.	Light	Light	
Darien 1,570	M		F R T	None	See McIntosh County	Open Dump	Light	Light	
Decatur 22,026		M R	F T	See DeKalb County		S.L.F.	Light	Light	
Dublin 13,800	F	M R	T	$3,000	10,000	Open Dump	Light	Moderate	
Eastman 5,120		R	M T F	None	5,000	Open Dump	Light	Moderate	

TABLE PH 1 (Cont'd)

Location and 1960 Population	Vector Problem Degree 1	2	3	Approximate Annual Costs of Vector Control Program* Present	Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
Eatonton 3,600		F	M R T	None	$ 5,000	Open Dump	Light	Light	
Fort Valley 8,310	F	M R	T	None	10,000	Modified Landfill	Light	Light	
Gray 1,320			M F R T	None	None	Modified Landfill	Light	Light	
Gordon 1,793		M F	R T	None	2,000	Open Dump	Moderate	Severe	
Jesup 7,304		F	M R T	None	15,000	Modified Landfill	Moderate	Light	
Lawrenceville 3,804		R	M F T	None	3,000	S.L.F.	Light	Light	
Ludowici 1,580		M F	R T	$1,000	8,000	Open Dump	Severe	Light	
Macon 69,764		F	M R T	5,000	50,000	Modified Landfill	Light	Light	

TABLE PH 1 (Cont'd)

Location and 1960 Population	Vector Problem Degree 1	2	3	Approximate Annual Costs of Vector Control Program* Present	Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
Milledgeville 11,120			M F R	None	$ 5,000	Modified Landfill	Light	Light	
Monroe 6,826		R	M F T	None	See Walton County	S.L.F.	Light	Light	
Monticello 1,931		M	F R T	$2,500	5,000	Open Dump	Light	Light	
Porterdale 2,365		F R	M T	None	3,000	Open Dump	Light	Light	
Social Circle 1,780		R	M F T	None	See Walton County	Open Dump	Light	Light	
Sparta 1,921		F	M F T	None	2,000	Open Dump	Light	Light	
Stone Mountain 1,976		M R	F T	See KeKalb County		S.L.F.	Light	Light	
Swainsboro 5,940		M F R	T	None	6,000	Open Dump	Moderate	Moderate	
Tucker		M R	F T	See DeKalb County		S.L.F.	Light	Light	
Winder 5,555		F	M R T	None	5,000	Modified landfill	Light	Light	

TABLE PH 1 (Cont'd)

Location and 1960 Population	Vector Problem Degree 1	2	3	Approximate Annual Costs of Vector Control Program*		Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
				Present	Needed				
Barrow County 14,485				$ 1,000	$ 6,000				Need expanded countywide rat control program
DeKalb County 256,782				10,000	20,000				Has countywide S.L.F. system
Emanuel County 17,815				Costs of this program included in Ogeechee Basin Technical Memorandum					Countywide rat control program
Gwinnett County 43,541				1,000	6,000				Need expanded countywide rat control program
Laurens County 32,313				6,000	6,000				Countywide rat control program
McIntosh County 6,364				Costs of this program included in Ogeechee Basin Technical Memorandum					
Newton County 20,999				1,000	6,000				Need expanded countywide rat control program
Walton County 20,481				1,000	6,000				Need expanded countywide rat control program
Lake Jackson				5,726	15,000				Mosquito control program operated by Ga. Power Co.
Lake Sinclair				11,848	25,000				Mosquito control program operated by Ga. Power Co.

*Costs of refuse collection and disposal are not included in this table.

1 - Severe	M - Mosquitoes
2 - Moderate	F - Houseflies
3 - Light	R - Rats
	T - Ticks

AIR POLLUTION

PROBLEMS

A 1959 report of the Industrial Hygiene Service of the Georgia Department of Public Health indicates that there are 34 industries in the Basin contributing pollution to the atmosphere. These include eighteen kaolin and rock crushing plants, two pulp and paper mills, and four asphalt industries located chiefly in DeKalb, Gwinnett, Washington, Wilkerson and Bibb Counties. Municipal, commercial, and individual establishments also contribute pollutants to the atmosphere. The dust, smoke, gases, fly ash, odors and particulate matter discharged to the atmosphere cause discomfort and give rise to probable health problems to the general population.

There can be found some kind of air pollution problem in almost every urban center in the Basin. Pulp and paper mills and the chemical industries release gases and smoke that cover large areas. The burning of garbage and refuse on dumps create a smoke problem in most of the smaller communities.

STATUS OF EXISTING PROGRAMS

Public Law 159, 84th Congress, and its amendments, provide for "Federal technical services and financial aid to State and local government air pollution control agencies and other public or private agencies and institutions in the formulation and execution of their air pollution abatement research programs." The Surgeon General may: (1) encourage cooperative activities by State and local governments for the prevention and abatement of air pollution; (2) collect and disseminate information relating to air pollution and the prevention and abatement thereof; (3) conduct investigations and research and make surveys; and (4) prepare and publish reports and make appropriate recommendations with regard to the control of air pollution.

National Air Network Sampling Stations are located at Macon and Atlanta; other stations are located outside the Basin at Savannah, Augusta, Columbus, and Jacksonville, Florida. The Georgia Department of Public Health cooperates with the Public Health Service in the program.

The Industrial Hygiene Service, Georgia Department of Public Health, has maintained records of complaints on industrial air pollution problems since 1945. Control measures used have consisted of investigation of these complaints, and where justified, discussion with the offending parties to work out a solution satisfactory to all persons concerned.

(6/1/62)

Work is underway by the Public Health Service and the State Department of Public Health on a statewide survey to locate all sources of air pollution in Georgia. The survey began January 1, 1961, and as of April 1962 a preliminary draft had been prepared.

EXISTING NEEDS

Georgia should enact enabling legislation to provide facilities for a broad program to control and suppress air pollution. In the September 1959 report, "Industrial Air Pollution Problems in Georgia", a need was expressed for a comprehensive study of air pollution problems in Georgia. The results of this study which has been completed should form a sound basis for industrial zoning, a tool which should be used in developing and planning abatement of air pollution in the Basin.

The September 1959 report indicated a need for some positive research on control of the industrial air pollution problems. This need is in the following order of importance: pulp and paper industry, rendering plants, industries disseminating oxides of nitrogen and sulfur, and the kaolin, talc, slate and Fullers earth industry.

POTENTIAL PROBLEMS AND SOLUTIONS

It is believed that industrial development and municipal growth in the Basin will increase each year contributing increasing pollution to the atmosphere. Measures should be considered for correcting air pollution from municipal, commercial and private sources. This would call for meteorological studies as an aid to zoning and planning functions, the preparation of air quality guides and eventually the establishment of air pollution emission criteria for logical air basins.

Research has produced methods and devices to eliminate gases, smoke, and particulate matter from the atmosphere. New industry should be required to install air pollution abatement devices and measures should be adapted now to control present polluters of the atmosphere.

COSTS AND BENEFITS

The costs of control of air pollution cannot be evaluated since specific quantity and quality information is not available for the sources.

Benefits to be derived from air pollution abatement result from reduction in nuisances, effects on public health, and decrease in maintenance costs of buildings and of personal property. Benefits are considered to be equal to costs of air pollution control.

RADIOLOGICAL HEALTH

PROBLEMS

The radiological health problems are best determined by considering all of the following sources of radiation: air, water, food and milk, and local sources such as medical and environment. The total effect of these sources is not known for the Altamaha Basin.

There are no nuclear reactors in the Basin, however, the Atomic Energy Commission has licensed a number of industries and hospitals at Athens, Atlanta, and Macon to use radioactive isotopes.

Weekly composite samples were collected by the Public Health Service for the U. S. Study Commission. The results of the radioactivity data collected during this study is presented in Table PH-2.

STATUS OF EXISTING PROGRAMS

There are no Federal, State or local radiological health programs operating in the Basin. The Georgia Department of Public Health plans a surface water monitoring program to collect background data in their streams. Georgia also wishes to inspect the facilities and operations of licensed users of radioisotopes which is now done by the Atomic Energy Commission.

EXISTING NEEDS

The Georgia Department of Public Health needs funds, personnel, and equipment to expand their radiological water and air monitoring programs and to further the surveillance programs for assuring the safety of food and milk. There is also a need for programs to assure the control of health hazards associated with the use and disposal of radioisotope wastes.

POTENTIAL PROBLEMS AND SOLUTIONS

It is expected that the use of radioisotopes will increase in the future. Control of their use is a State responsibility. Funds and personnel should be made available that will permit Georgia to have a balanced and effective program.

Solutions to future problems include the following:

1. Enact specific Georgia legislation to control radioactive pollutants and license isotope users.

2. Provide additional funds and personnel for statewide programs of control, and monitoring of air, water, milk, and food.

TABLE PH-2
RADIOACTIVITY IN WATER
ALTAMAHA BASIN

STATION	Period of Analysis	Number of Samples	Radioactivity (micro-micro curies per liter)			
			Alpha		Beta	
			Dissolved	Suspended	Dissolved	Suspended
Oconee R at Athens	11-60	6	0.0	0.0	1.9	0.5
	2-61	6	1.0*	0.7	2.6*	2.6*
	6-61	6	4.1	2.2	1.0*	1.0*
Oconee R at Milledgeville	11-60	6	0.0	0.0	3.0	1.0
	2-61	6	1.0	0.5*	2.6*	2.6*
	6-61	6	1.3	1.1	1.0*	1.0*
Oconee R at Dublin	11-60	6	0.0	0.0	2.7	0.8
	2-61	6	1.0*	1.0	2.6*	2.6*
	6-61	6	1.0*	5.9	1.0*	1.0*
South R at McDonough	11-60	6	0.0	0.0	3.4	0.5
	2-61	6	1.0*	0.5*	2.7	2.6*
	6-61	6	4.9	2.7	2.1	1.0*
Ocmulgee R at Jackson	11-60	6	0.0	0.0	3.6	0.5
	2-61	6	1.0*	0.5*	2.6*	2.6*
	6-61	6	1.0*	1.0*	1.0*	1.0*
Ocmulgee R at Macon	11-60	6	0.0	0.0	3.6	1.1
	2-61	6	1.0*	0.5*	2.6*	2.6*
	6-61	6	1.7	1.6	1.0*	1.0*
Ocmulgee R at Hawkinsville	11-60	6	0.0	0.0	2.7	1.0
	2-61	6	1.0	0.5*	2.6*	2.6*
	6-61	6	1.9	2.1	1.0*	1.0*
Altamaha R at Baxley	11-60	6	0.0	0.0	2.2	1.6
	1-61	6	1.0*	0.5*	2.6*	2.6
	6-61	6	5.5	1.0*	1.0*	1.0*
Altamaha R at Doctortown	11-60	6	0.0	0.0	2.0	0.5
	1-61	6	1.4	0.5*	2.6*	2.6*
	6-61	6	3.5	4.2	1.0*	1.0*

* Less than value shown.

SOLID WASTES

INTRODUCTION

Most communities collect and dispose of solid wastes as a governmental service, financing the operation by general taxation or by a special service charge. In a few instances, the collection and disposal is left to the individuals producing the wastes or to private collectors who charge a fee for the service.

Methods of disposal vary, including dumping on the surface, placing in sanitary landfills, and incineration. The amount of wastes produced on a national average is 0.8 to 1.0 cubic yard or about 650 pounds per person per year (approximately two pounds per person per day).

Incineration is considered as one of the best methods of disposal but only one of the communities in the Basin uses this method. Incineration of wastes is not economical for most of the communities of the size found in the Basin since it requires a population of 50,000 or more to support this operation.

Sanitary landfills are the best method of wastes disposal for any small community having suitable land available within reasonable hauling distance, and it can be used at a cost which is not prohibitive. It is an effective and proven method, accepted by the Georgia Department of Public Health.

For purposes of this portion of the Public Health Technical Memorandum the population of a number of cities and counties have been considered to be wholly within this Basin even though they are divided in other Technical Memoranda for the same Basin. Those included here are the city of Decatur and all communities of 500-2500 population in Clayton, DeKalb, and Gwinnett Counties. Other cities and counties of the Metropolitan Atlanta Area which lie in both the Altamaha Basin and the Apalachicola-Chattahoochee-Flint Basin have been included in the latter Basin Technical Memorandum on Public Health.

PROBLEMS

Open dumps (with burning) are the most common method of garbage and refuse disposal used by the smaller communities in the Basin. It is not, however, an acceptable method of disposal because of the health problems and nuisances created. Flies and rodents breed in the uncovered dumps and smoke and fumes from incomplete burning of garbage and refuse is offensive. Costs for dump operations are about 50 percent of that for the approved sanitary landfill type of disposal recommended for all but large urban centers.

Two areas within the Basin, Macon and Decatur, are fast becoming large urban areas. Decatur, with its surrounding urban area, has a 1960 population of over 150,000 and Macon exceeds 118,000. Land area for sanitary landfills may soon become scarce and will be at premium prices.

STATUS OF EXISTING PROGRAMS

State and local health agencies have adequate authority to control the storage, collection, and disposal of solid wastes. However, it is usually considered and handled as a local problem with consultation from the State Department of Public Health.

Eight communities including DeKalb County are known to be operating satisfactory sanitary landfills in the Basin. One of these eight, Athens, has both an incinerator and sanitary landfills for disposal of solid wastes. Another seven communities are operating modified landfills. The status of all the Basin's solid wastes program is not known, but it is assumed that all remaining 64 communities have open dumps for solid wastes disposal.

EXISTING NEEDS

There is a need for a total of 76 sanitary landfill operations in this Basin to serve approximately 240,000 population. These would serve communities having 500 to 50,000 population. Two urbanized areas, Macon and DeKalb County, have sufficient population to justify the installation of incinerators; Athens already has an incinerator. The total population to be served by incinerators for these three areas by 1965 would be 302,000.

Those communities not having proper local or county regulations to provide facilities for refuse collection and disposal need to adopt such regulations.

POTENTIAL PROBLEMS AND SOLUTIONS

Only one community, Athens, has an incinerator operating at the present time serving an estimated 31,400 persons. Decatur-DeKalb County have made tentative plans to install an incinerator and Macon has sufficient population to support an incinerator operation. During the period 1960-1964 it is assumed that all seven existing satisfactory landfill operations will continue and the seven modified landfill operations can immediately convert to satisfactory operations giving a total of 14 landfill operations which includes Decatur-DeKalb County and Macon.

By 1965 it is assumed that all 76 needed sanitary landfills will be operating and that Athens, Decatur-DeKalb County and Macon will have incinerators to serve 302,000 persons.

By 1975 there will be a need for 81 sanitary landfill operations to serve 303,000 persons, and incinerators to serve 389,000 persons in the three communities discussed above.

By 2000 there will be a need for 88 landfill operations to serve 585,000 persons. The county populations served by landfills in Clayton and Gwinnett Counties will be over 100,000 each. It has been assumed that each County will continue to use sanitary landfills for solid wastes disposal. Athens, Decatur-DeKalb County and Macon will operate incinerators to serve 772,000 persons.

Using a land requirement of one acre per 10,000 population per year, sanitary landfill programs and land requirements for the period 1960-2000 are shown in Table PH-3. The average population served by sanitary landfills over each of the three periods of time is used to calculate land requirements and annual costs.

TABLE PH-3
LAND REQUIREMENTS FOR SANITARY LANDFILLS
YEARS 1960-2000
ALTAMAHA BASIN

Period of Time	No. of Communities	Average Population to be served	Acres Required
1960 - 1964	14	332,300	166*
1965 - 1974	81	271,500	272
1975 - 2000	88	444,000	1110
		Total	1548

* Does not include land requirements for modified landfills.

COSTS AND BENEFITS

Present costs for construction of incinerators range from $2,000 to $4,000 per ton daily capacity. Operational costs vary considerably with the City of Atlanta reporting $1.48 per ton for the year 1959, and $1.27 per ton for 1960. Other cities report costs two to three times this amount.

Cost of operation of sanitary landfills averages $0.50 to $1.00 per ton of refuse handled. Cities as large as Los Angeles, California, and New York City use this method of disposal. New York City's experience has shown that disposal by sanitary landfills costs approximately half that of incinerators.

Cost of operation of a solid refuse program, including collection and disposal, will vary with each community but will, depending on the size of the community range from $1.00 to $4.50 per person per year.

The capital investment for the Athens incinerator in 1960 is estimated to be $130,000. The capital investment for incinerators for Athens, Decatur-DeKalb County and Macon are estimated to be $1,200,000 by 1965, $1,600,000 by 1975 and $3,100,000 by 2000. Annual costs for amortization, operation and maintenance of the incinerators, plus operation of sanitary landfills is shown in Table PH-4.

Studies have shown that improper solid waste handling breeds flies, which accounts for higher rates of diarrhea and dysentery, and for rodents which carry typhus and other less familiar diseases. Good sanitation practices, such as proper storage, collection, and disposal of wastes, help reduce these diseases. Improper disposal also breeds mosquitoes and creates odor nuisances. Open dumps often catch or are set on fire and become nuisances and air pollution problems. Benefits from adequate solid wastes handling operations are considered therefore to be equal to the cost of these operations.

TABLE PH-4
SOLID WASTES PROGRAM ANNUAL COSTS*
ALTAMAHA BASIN

Type of Operation	1960	1965	1975	2000
Incineration				
Capital Costs	$6,500	$58,000	$77,400	$150,200
Operation & Maintenance (including wastes collection)	31,400	302,000	389,000	772,000
Replacement	2,100	20,000	25,600	50,800
Sanitary Landfills				
Collection and disposal	450,000	700,000	824,000	1,200,000
Totals	$490,000	$1,080,000	$1,316,000	$2,173,000

*Includes collection costs

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SUMMARY AND CONCLUSIONS

SUMMARY

Insect-borne diseases do not constitute a major health problem in the Basin under present conditions, but the following diseases do present a continuous threat: encephalitis, malaria, typhus fever, Rocky Mountain spotted fever, and conjunctivitis. A portion of enteric disease transmission in the Basin is by houseflies.

Other insect problems in the Basin are the salt-marsh mosquitoes and sand flies in the seashore counties, houseflies, and eye gnats.

Important vector problems due to man's activities include those associated with the disposal of sewage, the storage and disposal of refuse, water-holding catch basins, mosquito breeding open surface storm water drainage ditches, uncontrolled flow from artesian wells, the disposal of dredge spoil material, and the accumulation and disposal of feed wastes and manure on farms.

There is no statewide enabling legislation for vector control districts in Georgia.

Present vector control programs consist of a few city mosquito control programs and several small county-wide rodent control programs.

Major sources of air pollution are the kaolin mills near the central portion of the Basin and large industries in the populated areas of DeKalb, Gwinnett, Washington, Wilkerson, and Bibb Counties. Other smaller sources are from local municipal and commercial operations in the urban centers.

A number of industries, hospitals, and professional people use radioisotopes in the Athens, Atlanta, and Macon areas. No nuclear reactors are located in the Basin.

An estimated 64 communities in the Basin are without adequate solid refuse handling programs. Eight communities, including one county-wide system, have well operated programs. One of these eight, Athens, has an incinerator and DeKalb County is planning to build a new one. Another seven communities have modified landfills which could be operated as sanitary landfills with a little modification.

CONCLUSIONS

Control measures and supportive services needed to reduce public health problems associated with insect and rodent vectors are:

1. State enabling legislation permitting the establishment of tax-supported vector control districts in any county of Georgia.

2. Regulations requiring the control of wasteful flow from artesian wells.

3. More extensive surveys of vector disease occurrence and vector problems.

4. Increased training of local health department personnel in vector control intelligence.

5. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and land resource developments.

6. Development of better permanent control techniques in salt marshes that will serve multi-interests.

7. Development of better equipment and methods for constructing and maintaining water management ditches.

8. Establishment of mosquito control districts in the following Georgia counties: McIntosh and Glynn.

9. Development of county-wide water management systems and programs.

10. Improved design for catch basins.

11. Increased use of sanitary landfills in towns and in counties, and increased use of county-wide refuse collection and disposal systems.

12. Development of improved methods for the sanitary handling of manure and other wastes on livestock and poultry farms.

13. Implementation of increased programs for the control and progressive eradication of alligatorweed, water hyacinths, and other obnoxious weeds in the Basin.

14. Better coordination between agencies so that vector control programs are compatible with multipurpose functions.

15. Establishment of county-wide rodent control programs where none exist.

16. Initiation of a State aid financial program in Georgia.

Based on present knowledge, the one vector problem that appears to be on the rise and could be a significant one in the Basin in 1975 or 2000 is mosquito-borne encephalitis. At present the only control of encephalitis is a program of prevention mosquito control for the community (or population groups) and protection against mosquito bites for the individual. Adequate housefly control is needed to eliminate the transmission of enteric diseases by the vector route.

The state-wide air pollution survey recently completed in Georgia should be utilized as a basis for planning of future control programs. Study and research should be undertaken to determine the feasibility of controlling dust problems associated with the kaolin mills in the central portion of the Basin. Control measures should be strengthened in the large urban centers to control smoke and fumes.

Funds are needed for the expansion of the radiological monitoring program in Georgia. Should nuclear reactors be located in the Basin in the future, control of their operations and wastes discharge will be essential for the protection of air, land and water resources.

Solid wastes handling programs at a cost of $490,000 annually are needed at present. This cost will increase to $1,316,000 by 1975 and $2,173,000 by the year 2000.

Sanitary landfills should be planned for all communities between 500 and 50,000 population. Clayton and Gwinnett Counties should operate a county-wide system of sanitary landfills. Athens, DeKalb County, and Bibb County (Macon) should plan to convert as quickly as possible (preferably by 1965) to disposal of solid wastes by incineration.

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APPENDICES AND BIBLIOGRAPHY

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APPENDIX
DEFINITIONS AND ABBREVIATIONS

1. cfs - cubic feet per second.
2. Garbage - putrescible animal and vegetable wastes resulting from the handling, preparation and consumption of foods.
3. gpcd - gallons per capita per day.
4. gpd - gallons per day.
5. mg - million gallons.
6. mgd - million gallons per day.
7. PE - population equivalent.
8. ppm - parts per million by weight
9. Pollution, water - the addition of sewage, industrial wastes, or other harmful or objectionable material to water.
10. Quality, water - is defined as the expression of water characteristics in terms of its physical, chemical, bacteriological, biological, and radioactive content.
11. Resources, water - is defined as the water available to serve mankind and his civilization for the varied, complex, and often conflicting beneficial uses. These uses include sources for municipal and domestic supplies, agriculture, industrial development, and for recreation, propagation of aquatic life and other forms of wildlife, navigation and ultimate waste disposal.
12. Supplies, domestic water - are those supplies used for individual families, including those also serving tenant families living on the property. Domestic supplies do not include commercial establishments, schools, churches, or camps.
13. Supplies, industrial water - are considered as industrially owned supplies, primarily developed for process or cooling purposes but which might be incidentally used for sanitary purposes.
14. Supplies, municipal water - are public supplies serving a municipality or communities of 50 or more people.
15. Supplies, semi-public water - are supplies for schools, motels, camps, and other supplies serving water to the public; or commercial establishments not classed as municipal or industrial.
16. Wastes, municipal - include all liquid wastes received by community sewers.
17. Wastes, industrial - the liquid wastes from industrial processes as distinct from domestic or sanitary sewage.
18. Wastes, solid (or Refuse) - includes all wastes of a solid nature not otherwise disposed of to the sewers or to the atmosphere. This includes all putrescible and nonputrescible solid wastes such as garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles, and solid market and industrial wastes.

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19. Wastes stabilization ponds - a properly engineered and operated pond for the biological reduction of organic wastes.
20. Water supply systems - includes the works and auxiliaries for collection, treatment and distribution of the water from the source of supply to the free-flowing outlet of the ultimate consumer.

Note: For the definition of any other terms which are used in these memoranda refer to Glossary of Water and Sewage Control Engineering. 1949 ASCE.

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